NEW ZEALAND
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Volume 81
Number 6
December 15,
1950.
(Established 1910)

NEW ZEALAND JOURNAL OF Agriculture

Published by
Direction
of
Hon. K. J. Holyoake,
Minister of Agriculture.

This Month's Cover

New Zealand is famous for its production of food, and the national economy depends on the export of large quantities of consumer goods. Our reputation as a great meat-eating people is not undeserved, however, and the per capita consumption of many staple foods reflects a high standard of living. Overseas visitors sometimes criticise the quality of our catering, but the culinary thoroughness of the New Zealand housewife in the celebration of Yuletide is illustrated in the Christmas dinner table reproduced on this month's cover from a natural-colour photograph by Sparrow Industrial Pictures Ltd.

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SUBSCRIPTION RATES

The "Journal" is issued monthly. The subscription within New Zealand is 2s. 6d. a year; the overseas subscription is 5s. The "Journal" may be ordered from any bookseller or newsagent, or direct from any office of the Department of Agriculture. Individual copies are available from Publications Section, P.O. Box 3004, Wellington, at 3d. a copy, post free.

Subscription inquiries (preferably accompanied by the address cut from a recent "Journal" envelope) should be sent to the nearest office of the Department of Agriculture.

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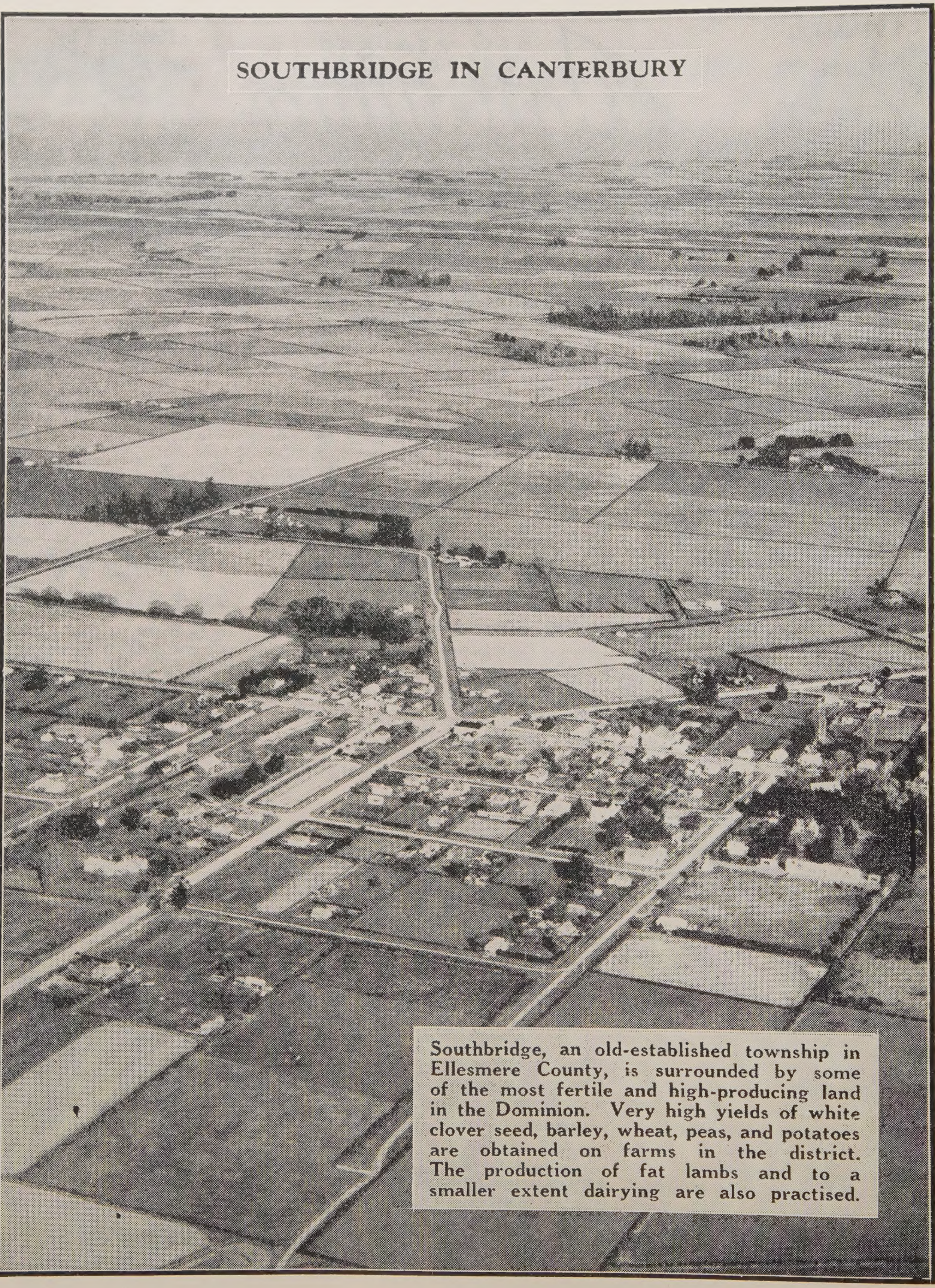
All correspondence relating to the "Journal" should be addressed to the Editor, "The New Zealand Journal of Agriculture," P.O. Box 3004, Wellington.

REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE.

SOUTHBRIDGE IN CANTERBURY



Southbridge, an old-established township in Ellesmere County, is surrounded by some of the most fertile and high-producing land in the Dominion. Very high yields of white clover seed, barley, wheat, peas, and potatoes are obtained on farms in the district. The production of fat lambs and to a smaller extent dairying are also practised.

[V. C. Browne photo.

A Time for Reinvestment in the Land

AT the time of the completion of the bulk purchase contracts for butter, cheese, and meat in 1948 the arrangements made seemed to offer reasonable security in a world of fluctuating economic conditions. It was expected that a seller's market would give way to a buyer's market and it appeared that the limitation in price fluctuations of 7½ per cent. would help to ease the period of transition.

To a very limited extent this has been the case, but there have been two factors tending to militate against the equitable operation of supply and demand. First, the price of imports has increased considerably, especially since the devaluation of sterling, and secondly, and what is a partial cause of this increase, the fairly rapid deterioration in the international situation culminating in the Korean war and the present state of extreme uncertainty has caused what is almost panic buying of certain raw materials essential to the prosecution of war.

Notable among these is wool, and gratifying as the record wool prices are in many respects, there is nevertheless an underlying danger in such high prices. I am not referring at the moment only to the inflationary consequences, but to the possible repercussions on our farming economy. It would be regrettable if there were too marked a swing away from dairy production, the export price for which is generally no higher than last year. This is especially true now that considerable progress is being made in finding fresh and lucrative markets for that proportion of our produce sold outside the contracts.

There are, of course, a number of reasons why such a swing is not likely to be rapid or marked, and I feel sure that in general the balance of our farm economy will be preserved.

In spite of the failure to obtain higher prices this year for dairy produce and meat, the future for our farming industries is, I consider, a bright one. New Zealand farmers can produce livestock products much more cheaply than their competitors in other countries. There is an almost unlimited demand for foodstuffs in a world in which two-thirds of the population is underfed, and though it is true that at present only a small proportion of this demand can be described as effective, an increasingly large proportion is becoming so as underfed countries improve their standards of living.

For these reasons I do not think that farmers need hesitate to embark on any farm development programmes they have in mind and the Government has been sufficiently optimistic about the future to give encouragement in a number of ways.

Soon after taking office, I took steps to establish the Primary Production Advisory Committee to advise me and, of course, through me the Government, on ways and means of assisting the primary producer. The guidance of a committee comprised of leaders of all sections of farming interests and representatives of interested State Departments has proved most valuable to the Government both on measures which it was intended to implement in any case and on the various proposals made by the committee itself. The following are steps taken during recent months, all designed to assist and encourage investment in the land.

Incentive Taxation Relief.—The disincentive of heavy direct taxation to increasing production is well known and is particularly marked in farming, because beyond a certain point considerable effort and expense are needed to attain production increases. The amendments made to the Land and Income Tax Act have been well publicised and there is no need for me to enumerate them here. Briefly they permit of much more liberal depreciation allowances and a wider range of items on which tax exemptions can be claimed.

Modification of the Servicemen's Settlement and Land Sales Act.—It has not been practicable or desirable to abolish this Act immediately, but the more obnoxious provisions have been amended so that farmers can now develop their properties in full knowledge that they will receive the full market value if they sell.

The Marginal Lands Board.—Activities under this board, recently set up under the Marginal Lands Act, will result in improvement in hill-country sheep farms, so valuable to New Zealand's economy because of their function as a source of supplies of store stock.

Supplies of Farm Requisites.—It would be nonsensical to talk of investment in land without adequate supplies of the tools of production and it would be idle to pretend that all farm requisites are yet in ample supply, but it is true that supplies of farm tractors and other machinery, fencing wire, and fertilisers have greatly improved and it is hoped that steps now in hand regarding immigration will eventually at least ameliorate the labour shortage.

In the present uncertain state no one can safely prophesy economic conditions more than a very short time ahead, but as far as can be seen at present there is every reason to be optimistic about the future of our primary industries and this, with the steps taken to increase production, should leave little room for doubt as to the wisdom of investing money in land development.

K. J. HOLYOAKE, Minister of Agriculture.

CARE OF LIVESTOCK DURING JANUARY

Contributed by the Animal Research Division.

LAMB WEANING

WEANING is an important event in the life of a lamb and special care taken at this time will be well repaid. Long-wool lambs should be shorn and all others crutched. Weaning is the most important time for drenching against worms, and this is especially necessary in wet summers. A full dose of 20 gm. of phenothiazine should be given. If fattening crops are not available, lambs should be drafted into clean paddocks after drenching. Lambs should never be weaned into paddocks in which ewes and lambs have been grazed during the previous month. Unless very good paddocks of spelled pasture are available, hoggets should be spread thinly over as large an area as possible.

* * *

LAMB-FATTENING FODDERS

Rape should not be grazed until the leaves show a purplish tinge. "Unripe" rape does not fatten lambs so quickly and seems to scald them more readily. Best results are probably obtained by grazing in breaks which last the lambs about a week. As it is false economy to keep lambs on a break until the last leaf is eaten, move them on while they are still getting a full feed. The paddock can be cleaned up with ewes. Run-offs have little to recommend them and unless they contain good pasture they will depress the rate of growth of lambs. If hay is fed, it must be of the very best quality. Thousand-headed kale is splendid lamb-fattening fodder, but because it is relatively unpalatable it must be managed properly and always fed in small breaks and only grazed lightly before moving the lambs on to the next break. Never use a run-off. Treated in this way the kale makes excellent regrowth and can be regrazed several times and if necessary the grazing can be extended into autumn and winter.

* * *

EWE CULLING

After weaning, the ewes should be gone through carefully to select those which require culling. Teeth, feet, and wool should be examined carefully. Special attention should be paid to udders and teats, and ewes should be culled if they have defective udders or very large or damaged teats. The lambs of such ewes often die from starvation before they are a week old. Condition is a poor guide for culling, as the ewes which have not reared a lamb are always in the best condition. Ewes should be kept on low rations during the next 2 months to prevent them from becoming overfat.

* * *

FOOT-ROT ERADICATION

Campaigns for foot-rot eradication should be started as soon as the lambs have been weaned. Once foot-rot has been eradicated from a flock it does not recur unless it is reintroduced from outside. The Department of Agriculture Bulletin No. 325 gives full instructions for eradicating foot-rot from a flock.

* * *

SHEEP DIPPING

Modern dips are so effective that the eradication of lice and ticks should be quite feasible. Best results, however, will only be achieved if the instructions for mixing and replenishing dips are followed accurately. Carelessness in dipping can cause disastrous losses. If sheep are dipped off the shears, the shear cuts are liable to become infected and deaths from blood poisoning may occur. This risk can be prevented by vaccinating with blackleg vaccine at least a fortnight before dipping. The vaccine is available at a reasonable price, and Departmental Veterinarians or Inspectors of Stock should be consulted regarding its use.

* * *

ST. JOHN'S WORT MAKES DIPPING DANGEROUS

Sheep that eat St. John's wort become sensitive to sunlight, and scabs develop on the ears, face, and back. If sheep in such conditions are dipped, they take convulsions and may be drowned. If possible, sheep should be grazed for several weeks before dipping on country free from St. John's wort. If this is not possible, dip on dull days only.

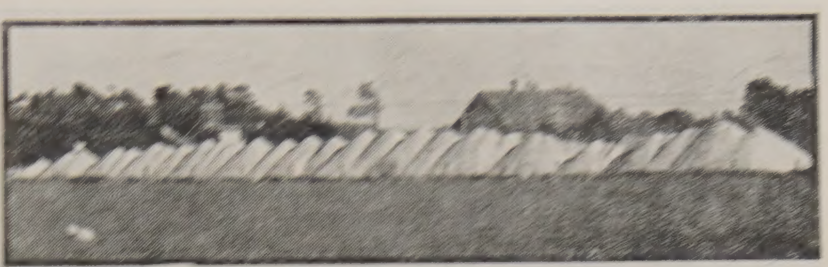
The Advantages of Stockpiling Lime

TO ensure that lime is available when it is wanted and to relieve pressure on road and rail transport at busy seasons, substantial stockpiles have been established in some farming districts of New Zealand which are served by the railway. The advantages of stockpiling and the steps to be taken before a stockpile is established are outlined in this article by L. C. Scott, Advisory Officer, Department of Agriculture, Wellington.

THE benefits to be derived from lime stockpiling are influenced by the lime transport assistance scheme, under which allowances are granted on the carriage of lime. The operation of the scheme was detailed in an article in the "Journal" for October, 1949. The road-allowance provisions have since been liberalised by an increase of 2d. per ton mile after 20 miles on lime delivered in areas not served by rail, and the provisions in respect of deliveries from stockpiles have been amended by a reduction of the road distance limit from 23 to 15 miles.

Bulk Deliveries

Though some methods of delivering and applying lime have eliminated the use of sacks, a substantial proportion of the total annual lime delivery is still bagged, and that is likely to continue to be so. The sack position became difficult soon after the Second World War started, and sack-hire charges advanced rapidly from 1d. or 2d. a sack to 3d. or 4d., the latter rate being equal to 5s. 4d. per ton of lime. That increase may be regarded now by some people as a blessing in disguise, for undoubtedly it directed attention to bulk distribution, and particularly to direct deliveries by road.

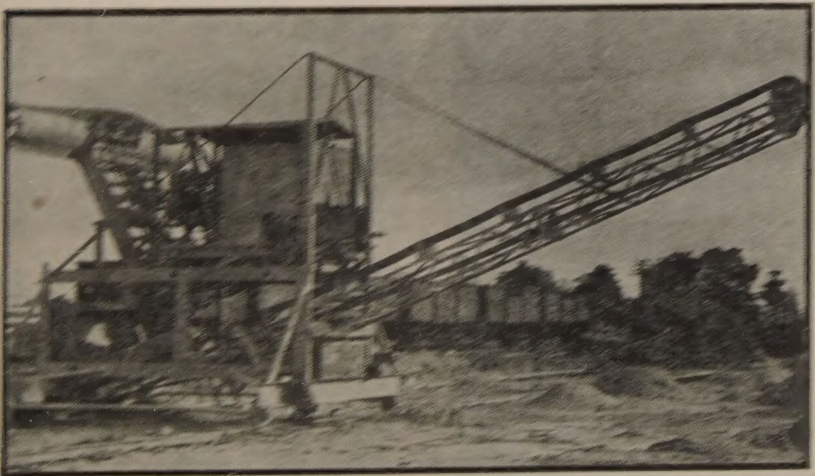


A 3000-ton lime stockpile, which it is intended to build up to 10,000 tons.

Bulk delivery by rail is still comparatively new. It has the disadvantage that the lime must be transferred from railway wagons to road vehicles, and possibly again from the lorries to spreading units. Even when these transfer problems have been solved, bulk handling presents other difficulties, especially if the equipment available can spread only dry lime. For instance, railway wagons must be covered, the lime must be protected from wet weather after its arrival at rail delivery points, and delays in unloading will occur if protective coverings are not available. Even when the weather is favourable, the ability of the railways to effect deliveries when desired by farmers is a limiting factor, and the dust nuisance is always present when dry lime is being handled. If equipment capable of handling damp or wet lime is available, many of these problems disappear, and even more are eliminated when the equipment is operated from stockpiles.

Advantages of Stockpiles

Stockpiles of railed lime are beneficial in many ways. They provide farmers with lime at prices below those at which bagged lime can be obtained, and they are built up during the slack months of the year, giving better balance in both lime production and utilisation of railway wagons.



The machine which conveys the lime from the railway wagons to the stockpile.

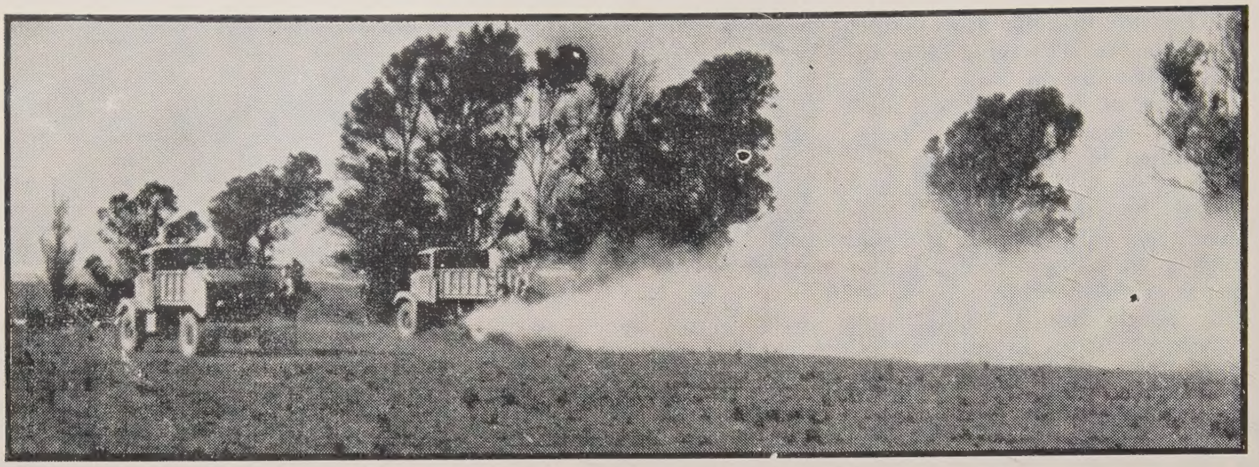
Even when rail transport is not entailed, advantages can be gained from stockpiling in certain areas within the 30-mile limit to which road allowance under the transport assistance scheme applies for direct road deliveries from limeworks to farm. In such areas the road allowance is calculated as from limeworks to farm, though the final operation may be a delivery from stockpile to farm. The pressure on transport in the busy season is relieved, for either the limeworks or local carriers interested in lime spreading can move the lime to stockpile points during the slack carrying season. The extra costs of loading from a stockpile are more than offset by the saving of delivery final time and by the use made of lorries to build up the stockpile at a slack period. An important consideration in such an area is the selection of the stockpile site, because road-allowance distance is calculated as from limeworks to farm, and consequently stockpile deliveries to farms between limeworks and stockpile carry no road-allowance recompense for double running.

Problems to be Overcome

Unfortunately all limes cannot be stockpiled, but the number in this category is not as great as was expected at first. Departmental experiments suggest that clay-like impurities, rather than calcium carbonate content, are the main bar to stockpiling, even when the lime is very finely ground, but the type of machine to be used for stockpiling is also important. To test the behaviour of lime in a stockpile suppliers should set up several heaps and open them at, say, monthly intervals after they have been exposed to wet weather for varying periods. The Department of Agriculture will not approve of any rail stockpile being established until it has evidence that the lime concerned can be stockpiled satisfactorily, and it recommends that any one considering other types of stockpiling first make certain of the behaviour of the lime in a stockpile.

Few of the spreading units at present in use can handle damp or wet lime. Therefore, even though lime suitable for stockpiling may be available, stockpiling is practicable only at points where facilities for spreading damp lime are available.

The first stockpile established resulted from initiative by the manager



Two spreaders each distributing 1 ton per acre. That on the right is using dry lime and that on the left wet lime.

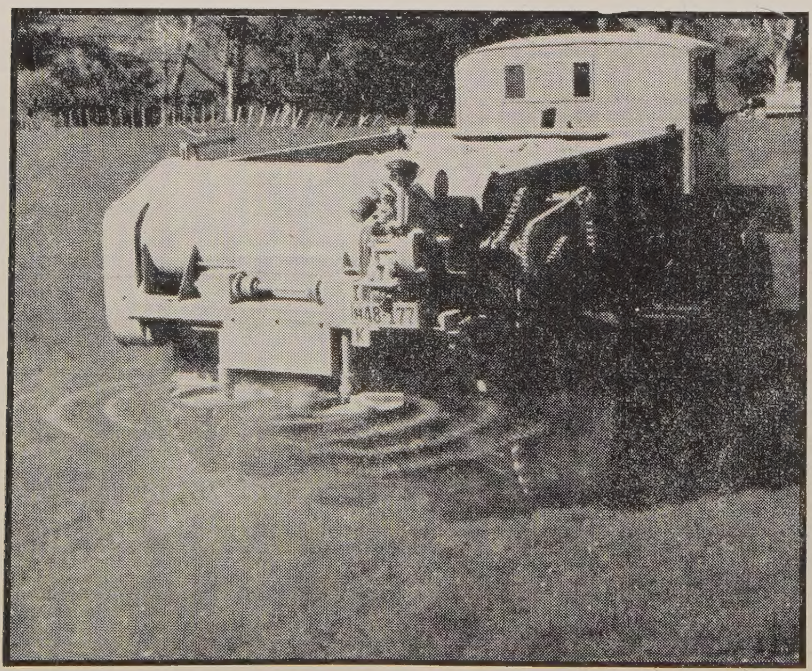
of a limeworks. He interested himself in a machine to spread damp or wet lime, and then designed equipment capable of unloading railway wagons rapidly. His efforts were supported by the manager of a carrying business interested in the delivery and spreading of lime. Subsequent stockpiles have been built on the initiative of operators prepared to obtain equipment capable of handling and spreading wet lime; their lime suppliers have co-operated with them, and this appears to be the way in which stockpiling is most likely to develop.

Conditions of Approval

Approval to establish a stockpile to which supplies of lime are to be railed must be obtained from the Director-General of Agriculture and the right to a site must be obtained from the Railways Department. It is usual for the applicant first to ascertain whether the Director-General favours the establishment of a stockpile in the proposed area; then the exact site can be selected in consultation with local officers of the Railways Department.

Stockpile approvals are given when the Director-General is satisfied that the lime will stockpile satisfactorily, that the area is not already satisfactorily served by adjacent limeworks, that a suitable site is available, that delivery and spreading service from the stockpile will be adequate, that methods of handling lime into and out of the stockpile will be satisfactory, that the proposal is financially sound, that the lime will be up to the same standard of quality and fineness of grinding as bagged lime from the supplying limeworks, and that the price of lime from the stockpile is reasonable in view of the fact that it has been carried by rail to the stockpile at lime transport assistance rail rates.

Because of the advantages that can accrue, farmers in areas served by rail are strongly recommended to interest their lime-spreading contractors in bulk distribution from stockpiles. There will be no worries about whether lime will be available when required, such as are inevitable at certain seasons when inward lime and fertiliser supplies and outward primary produce are all causing rail congestion, and the lime will be just as cheap, or cheaper, because the supplier will be able to produce it at a steady annual rate and thereby retain his employees by providing them with steady work. Every stockpile established so far is selling lime at a price below that at which it can otherwise be delivered at the stockpile railway station, and the margin is sufficient to offset cost differences at most other stations within each stockpile area.



A spreader distributing wet lime.

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HEADING PHOTOGRAPH: A bullock wagon on Kinloch Station, Banks Peninsula. On this station the use of bullocks was continued for longer than elsewhere.

FARMING IN CANTERBURY

THE period 1880 to 1900 in the development of Canterbury farming is described in this, the second article of a series of four compiled by P. R. Stephens, Assistant Investigating Officer, Department of Agriculture, Wellington, from notes supplied by officers of the Extension Division. Last month's article dealt with the first period, from the founding of the province in 1850 to 1880, and in the January issue of the "Journal" the third period, 1900-1920, will be described. This article deals with the growth of population, the opening up of the land by roads and railways and the subsequent spectacular rise of "bonanza" wheat farming, the beginning of the meat export trade and the changing farm management patterns caused by this new trade, the rabbit menace, and the start of scientific training in agriculture.

POPULATION TRENDS 1850-1880

When the first census in New Zealand was taken in 1848 there were 265 people (159 males and 106 females) living in the Akaroa district, which included the whole of Banks Peninsula. Of the 184 people born outside New Zealand 120 were from Britain and Ireland, 10 from British colonies, and 54 from foreign countries, most of whom would be from France. When the 81 colonial born are excluded it can be seen how the cultural influence of the French was being submerged under that of the English-speaking people.

The occupations of the people in the settlement showed their dependence on agriculture. Adult male workers numbered 104, of whom 42 were farm workers, 18 land proprietors, farmers, and merchants, and 22 mechanics and craftsmen. This last group included sawyers, carpenters, joiners, blacksmiths and shoemakers, all tradesmen much needed in a new community. Their number also shows that a somewhat diversified though simple economy had evolved in the previous decade. The remainder of the male workers included shopkeepers, clerks, overseers, sailors, and fishermen.

The growth of Canterbury's population, both from migration and natural increase, between 1851 and 1881 is shown in Table 1, on the next page.

Increases in those born in New Zealand and those born outside New Zealand were recorded at all censuses. An important aspect of Table 1 is the increasing population of New Zealand born. In 1858, 8 years after the first ships arrived, the percentage of New Zealand born to total population was 22 and by 1881 it had risen to 44. Though most of these people by 1881 would still be in the younger age groups, the rise of a native-born population without direct ties to another land must have been exerting an influence on the social fabric.

Overseas Immigration

By 1858, only 8 years after the founding of the settlement, there were 7029 people resident in Canterbury who were born outside New Zealand. People had thus been arriving at an average of about 900 per year. Actual immigration would be larger, because this figure makes no allowance for deaths and people departing from the province.

Andersen writes: "From 1855 to 1870, 88 emigrant ships arrived in Canterbury, bringing 15,029 statute adults". Presumably these entered under the Canterbury immigration schemes. From 1858 to 1870 a total of 29,972 immigrants entered Canterbury, so that it seems that about half the immigrants in this period did not enter under assisted schemes.

This high number of immigrants in the 1870's is a consequence of Vogel's policy. From 1872 to 1881 there was a total of 39,075 immigrants into Canterbury, of whom 27,982 were helped under immigration schemes, the greatest number coming in 1874.

Internal Migrations

Gold was found in every South Island province except Canterbury. But Canterbury, in the centre of the South Island and surrounded by gold-bearing provinces, was in a unique position to be affected by internal migrations induced by gold discoveries. The Maori Wars in the North Island were another cause of population movement.

POPULATION TRENDS IN CANTERBURY . . .

TABLE 1—GROWTH OF POPULATION IN CANTERBURY 1851–1881

Census	Population			Increase		
	Born in N.Z.	Born outside N.Z.	Total	Born in N.Z.	Born outside N.Z.	Total
December, 1851 ..	—	—	3,273	—	—	—
December, 1858 ..	1,938	7,029	8,967	—	—	5,694
December, 1861 ..	4,055	11,985	16,040	2,117	4,956	7,073
December, 1864 ..	7,076	25,200	32,276	3,021	13,215	16,236
December, 1867 ..	10,800	27,500	38,300	3,700	2,300	6,000
February, 1871 ..	17,667	29,134	46,801	6,800	1,600	8,400
March, 1874 ..	24,147	34,628	58,775	6,480	5,494	11,974
March, 1878 ..	36,840	55,082	91,922	12,693	20,454	33,147
April, 1881 ..	48,931	63,251	112,182	12,091	8,169	20,260

Note: For the 1864 and earlier censuses Westland's population is of little consequence, though it is for the 1867 census, for which separate statistics on some items can be obtained, but not on birthplaces. Based on data for the 1867 and succeeding censuses, an estimate of 2300 New Zealand born was made for Westland in 1867.

Little direct evidence appears to be available on the volume of internal migration between provinces. Though no precise proportional relation between gold production and population is assumed, it is probably a fair assumption that gold production trends afforded some indication of population movement on the goldfields.

The Otago gold rush began in June, 1861. Between the censuses of 1858 and 1861 the number of males migrating from Canterbury appears to have been appreciably large. By the census of 1864 the flow had reversed and the gain in the second period far exceeded the loss in the first. Though some of these had fled the Maori Wars in Taranaki, the majority doubtless came from Otago in 1863 and 1864.

The Westland rush initiated in December, 1864, attracted tens of thousands, most arriving by sea. First arrivals were naturally from within New Zealand, but equally large numbers arrived with the "Australian invasion" which began in 1865. Outward migrants from Canterbury between the censuses of 1864 and 1867 appear to have been more numerous than during the Otago rush, but still the number relative to the growth of Westland was small and possibly the loss to Canterbury was not as great as is often believed. Many people from Canterbury had most probably previously been migrants from the Otago gold rush.

From the census of 1867 to that of 1881 Canterbury gained population continuously from inward migration. This is in contrast to the South Island as a whole, in which internal migration was outward and therefore to the North Island. This became obvious in the census period of 1867-1871, when Otago had the greatest outward migration of any province.

Rural and Urban Population

No clear line can be drawn between rural and urban population. Towns with a population of 1000 or more have been classified as urban; townships with fewer than 1000 and population in open country have been classified as rural. Urban population comes from three sources; from natural increase in the towns themselves, from people migrating to urban areas, and, last, from accretion, that is, by townships gradually growing to such a size that they are classified as urban or by towns expanding until they absorb townships and population on their fringes. The growth of rural and urban population in Canterbury from 1851 to 1881 is shown in Table 2.

From 1851 to 1864 urban population consisted only of the towns of Christchurch and Lyttelton. Urban areas added later (with the census date in which they were first included shown in parentheses) were: Timaru (1867), Kaiapoi (1874), Sydenham, Rangiora, Oxford, Ashburton (1878), and Waimate (1881).

TABLE 2—INCREASE IN RURAL AND URBAN POPULATION IN CANTERBURY 1851–1881

Census year	Total population			Urban population			Rural population		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1851 ..	1,965	1,308	3,273	1,419	939	2,358	546	369	915
1858 ..	5,301	3,666	8,967	1,420	1,158	2,578	3,881	2,508	6,389
1861 ..	8,939	7,101	16,040	2,643	2,506	5,149	6,296	4,595	10,891
1864 ..	18,931	13,345	32,276	5,155	4,072	9,227	13,776	9,273	23,049
1867 ..	21,206	17,127	38,333	5,249	4,935	10,184	15,957	12,192	28,149
1871 ..	25,781	21,020	46,801	5,869	6,031	11,900	19,912	14,989	34,901
1874 ..	32,294	26,481	58,775	8,509	7,730	16,239	23,785	18,751	42,536
1878 ..	50,424	41,498	91,922	16,598	15,437	32,035	33,826	26,061	59,887
1881 ..	60,590	51,592	112,182	20,190	18,788	38,978	40,400	32,804	73,204

TABLE 3—COMPARISON BETWEEN NUMBERS IN RURAL AND URBAN OCCUPATIONS IN CANTERBURY 1858–1881

Census year	Rural labour force				
	Agricultural and pastoral occupations	Numbers of other labour force	Total rural labour force	Urban labour force	Total labour force
1858 ..	.. 800	1,700	2,500	900	3,400
1861 ..	.. 1,400	2,500	3,900	1,600	5,500
1864 ..	.. 2,600	6,900	9,500	3,600	13,100
1867 ..	.. 4,200	5,700	9,900	3,300	13,200
1871 ..	.. 4,700	7,300	12,000	3,500	15,500
1874 ..	.. 7,900	6,200	14,100	5,100	19,200
1878 ..	.. 12,600	7,800	20,400	10,000	30,400
1881 ..	.. 12,800	11,100	23,900	12,000	35,900

By the census of 1851 only a year had elapsed since the first Canterbury settlers had arrived, there being 1216 people in Christchurch, 1142 in Lyttelton, and only 915 in rural areas, including 441 in Akaroa. At that date the pastoral occupation of the plains had scarcely begun.

Seven years later, at the census of 1858, the distribution between rural and urban areas was reversed. The total population of urban areas was just a little higher than in 1851, but the rural population had soared to 6389. From 1858 both rural and urban population gradually increased until 1874, but between 1874 and 1878 the urban population had doubled, though the rural population had increased as well.

Occupations

Changes in the occupations reveal the developing nature of an early settlement. Initially, emphasis would be on agriculture, but at the same time as settlement became more widespread there would be a heavy demand for labour on roads and communications. This in turn would naturally be followed by the development of industry and commerce.

Up to 1874 occupational statistics for males and females are combined in censuses, and separate figures are not available. From 1874 statistics by sex are available, but in the same census the classification of occupations was revised so that comparison with earlier censuses cannot always be readily made. However, statistics are available for those employed in agricultural and pastoral occupations and a safe comparison between all censuses seems feasible. To achieve a comparison between agricultural and pastoral occupations and other occupations, the following assumptions and methods have been employed:—

1. Agricultural and pastoral workers for the censuses of 1871 and before have all been regarded as males.
2. The total male labour force has been regarded as total males less those under 15 years of age.
3. Males under 15 years are in the same proportion in rural as in urban areas. By applying this percentage to the total males in urban and rural areas an estimate of the labour force in urban and rural areas is obtained.

The results of computations made on the basis above are shown in Table 3.

Numbers of workers engaged in agricultural and pastoral occupations show a regular and substantial increase at each census, except in 1871 and 1881, when there were halts in progress but no recession.

The most outstanding fact is the large number of non-agricultural workers in rural areas. Numbers rose at each census except those for 1867 and 1874. However, as a percentage of the total labour force the group declined in general over the whole period. These men would be engaged in opening up communications and generally preparing the way for settlement. That the numbers so engaged appear to exceed those engaged in agriculture until 1874 may seem surprising, but until the work of the non-agricultural labour group was completed more intensive settlement was severely handicapped.

The urban labour force rose to about 3600 in 1864 and remained substantially constant until 1871. In the next decade it rose steadily to reach 12,000 by 1881. The greatest proportion of the urban population in Canterbury was located in Christchurch, where the new secondary industries were growing up.

TRANSPORT

Once the site of the capital was selected the first need of the settlers was to push ahead with the Sumner road begun by Captain Thomas before the arrival of the colonists; this was a source of financial worry to Godley, and for some years freight from the port to the capital came by sea to Sumner in spite of the exorbitant charge of 25s. per ton. The purchase of a small schooner was one of the few occasions on which Godley did not leave transport to private enterprise. Much discussion took place in the Provincial Council about the means to overcome the difficulties of transporting freight, and until the Sumner road was opened in 1857 the sea route remained the only one in spite of its dangers. Great use was made of small coastal boats in the first decade, especially in North Canterbury, the mouths of the Kaiapoi, Waimakariri, and Ashley Rivers all being miniature ports.

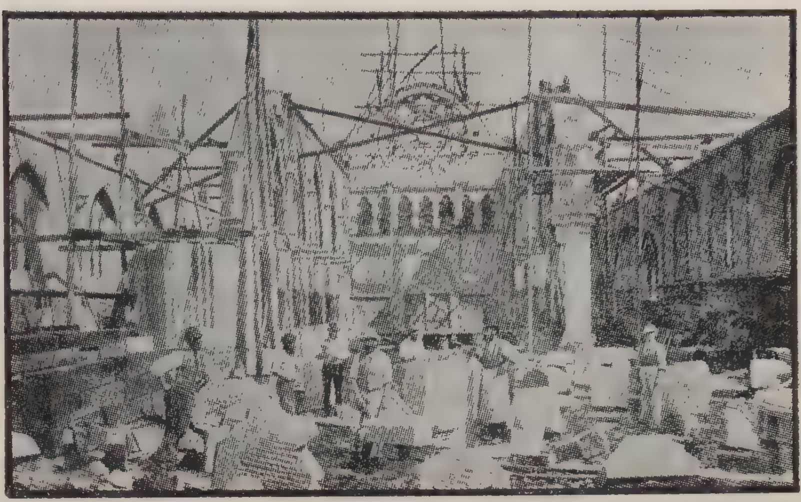
Building of Roads

Road construction did not really begin until a Road Ordinance was passed in 1856; most of the work was done by contract under the supervision of waywardens, the contractor being paid in land selected from Crown lands to the value of £2 per acre. Not very much progress was made, however, until a number of road boards were set up under the Road Ordinance of 1863. Local levies, toll gate revenues, and Provincial Government grants provided the financial backing for the steady improvement and extension of roads which followed. These boards received an increasing share of provincial revenues and were given wide powers over drains, ditches, and streams.

Road boards formed the beginning of local administration in country districts and at a time when interest in local affairs was greater than now their life was a lively one. Keeping their toll gates functioning was not the least of their worries. Bridging of rivers and metalling of roads meant the passing of another picturesque feature of early Canterbury—the slow and lumbering bullock teams, which gave way to the teams of heavy draughts. The number of horses in Canterbury showed the most rapid increase in the prosperous 1870's, and it was not until the turn of the century that the numbers rose rapidly again.

The name always associated with coaching is that of the firm of Cobb and Co., who commenced business in Christchurch in 1864, running twice and later three times a week to Timaru and once a week to Waitangi (later Waitaki). Services were also run

IMPROVEMENT OF TRANSPORT FACILITIES



[*From the 1900 jubilee number of the "Weekly Press", Christchurch.*

The foundations of the Christchurch Cathedral were begun in 1864, but work ceased the next year. It recommenced in 1873 and the consecration service was held in 1881.

As roads were improved in the 1860's and 1870's the lumbering bullock teams gave way to draught horses.

EXTENSION OF RAILWAYS

[*New Zealand Railways photograph.*

The south express, pulled by two locomotives, at Timaru in 1885. The first through train from Christchurch to Dunedin ran in 1878.

northward to Kaiapoi, Rangiora, and Oxford and later to Akaroa and Hurunui.

The grandeur of the west coast route and the glamour of life on the "gold coast" excited the greatest interest. The west coast road was completed in record time and a coach was running to the coast a little more than a year after the discovery of the goldfield was first announced. Begun in March, 1865, and completed within a year by over 350 men, the road was 160 miles long and cost £150,000. Though Westland had a road to Canterbury very early in its existence, the reluctance of the Provincial Council to do much more to the roads in the area was one of the main reasons for the demand for Westland's separation.

Communications linking Canterbury with Marlborough and Nelson were much longer delayed. The Cheviot and Amuri districts were a long way from Nelson, but at the same time they were not Canterbury's responsibility, and as the land was taken up in large runs, very little was spent on public works. A through road from Blenheim and Nelson to Christchurch was eventually opened in 1891 and even then was not a particularly good one, especially the stretch from Waiau to Kaikoura. The Government was reluctant to proceed with the opening up of this area by roads and railways until the large estates were acquired, as otherwise the value of these estates would have been enormously enhanced at the expense of the State.

Expansion of Railways

William Sefton Moorhouse has been described as the forerunner of Julius Vogel because of the bold and skilful way in which he stressed the need for public works; it is at least certain that the remarkable expansion of railways within the first 20 years of the province's history was due to his vigour and foresight. His own words in introducing the Canterbury Loans Bill of 1862 expressed his ideas most forcibly: "The geographical peculiarities of the settlement are conclusive arguments why the railroad is at once the most convenient and inexpensive medium of communication. It is certainly impossible for settlers to effect a beneficial occupation of the rich arable tracts at a distance from the port if they are to remain dependent upon the slow and highly expensive transit of produce by the old-fashioned macadamized road".

The first railway in Canterbury and New Zealand, between Christchurch and Ferrymead, was opened in 1863, and 2 years earlier the construction of the Lyttelton tunnel had been started by Holmes and Co., of Melbourne, who had the benefit of the geological knowledge of Julius von Haast. The breach was first made in May, 1867; by December a train ran from Christchurch to Lyttelton.

Progress on the south line was much slower; the seemingly level plains presented more difficulties than was first apparent, and by 1864 the Council's finances were rather strained. William Rolleston, who followed Moorhouse as Superintendent, favoured a policy of retrenchment, and by 1867 the line had reached only Selwyn. Charges were also made that the Provincial Council railway administration was inefficient and that the contractors were making excessive profits.

The revival of prosperity after 1870 enabled the line to be pushed ahead more rapidly; the stretch between Rakaia and Ashburton was laid down in 1874, Timaru was reached in 1876, and by 1878 the first through train ran from Christchurch to Dunedin. Besides the main line, branch lines had been extended to the Methven, Springburn, Fairlie, Waimate, and Oxford areas. By 1880 the Canterbury railway system was much as it is today, with an "interior main line" from Oxford to Temuka projected. After 1880 steam power appeared more and more on the roads as well, with traction engines pulling long rakes of trucks piled with sacks of grain or bales of wool.

To complete their railway system the people of Canterbury demanded the construction of the Midland Railway to bring the west coast's supply of coal and timber within their reach and at the same time to open up the coast as a market for agricultural produce. Despite the popular clamour, Parliament was not prepared to do anything, even refusing to adopt the arrangement that representatives of Canterbury, Westland, and Nelson had made with an overseas contractor in 1885. Undeterred, the Canterbury promoters concluded an agreement with a London syndicate to which Vogel as Colonial Treasurer agreed. The company was a land grant construction corporation established in London in 1886 with a capital of £500,000; 6,000,000 acres of Crown land in three provinces were set aside in sections for the company to take up as each section of the line was completed. On the Canterbury side the work advanced very slowly, and up to 1895 only 5 miles of line, from Springfield to Kowai, had been laid, though much better progress was made in Westland. In the following year the Government refused any further extension of the term of the contract and took possession of the line. Prolonged litigation followed the company's claim for £1,800,000, the Privy Council finally deciding in favour of the Crown.

RISE OF ARABLE FARMING

A complex set of factors produced the "bonanza" wheat farms of the late 1870's and 1880's, the most important probably being the construction of the railway and the need to plough up the tussock-covered plains before planting better-quality grasses. The first export of wheat to England was made in 1867, when a firm of merchants in Kaiapoi dispatched some parcels of wheat in the Matanoka and the Mermaid.

Up to 1875 the trade was of fairly modest proportions, but from then it

John Grigg of Longbeach, which was famous for both its crops and its stock. John Grigg was one of the first to realise the importance of the frozen-meat trade, and the reputation that Canterbury lamb acquired was largely due to his insistence on the highest quality.

Reapers and binders at work on the New Zealand and Australian Land Company's Pareora estate, where some notable crops were produced toward the end of last century.

expanded very rapidly, the record being reached in 1883, when 5,000,000 bushels, of which nearly 4,000,000 came from Canterbury, were exported from New Zealand. Undoubtedly in the late 1870's and early 1880's wheat production was much more profitable than anything else on the better-class land, the average price being 7s. 7d. per bushel over the years 1871-1880. The introduction of labour-saving machines over the same period—reapers and binders, traction engines, threshing machines, and more efficient ploughs—speeded up the change-over, and for some years it seemed that large-scale wheat growing for export would always have a significant place in the New Zealand economy.

High Freights

As usual, freights were high, up to 2s. 6d. a bushel, inferior types of ships were used to carry grain, partial damage was not covered by insurance, and growers were often careless enough to ship various qualities under one brand. The smaller farmer who could not himself consign was again at a disadvantage, especially as he was more dependent on the return from wheat than the large landowner who utilised only part of his land for grain growing. On some of the large properties—the Levels, Pareora, and Waikakahi—most of the land was sown down in a crop at some time or another, primarily for the purpose of breaking in the land before sowing down grass.

Two of the best-known wheat growers in this period were John Grigg of Longbeach and Duncan Cameron of Methven. These two men developed the productivity of their estates by very different methods, Grigg by large-scale draining and Cameron by an elaborate system of irrigation. In 1879-1880 Longbeach grew 3000 acres of cereals; by 1891-1892 the area had been extended to 4600 acres of wheat, 2000 acres of oats, and 280 acres of barley. In 1894 on Cameron's Springfield estate there were 5500 acres in wheat and 1200 in oats. Other places at times also had large areas devoted to cereal production. The Studholmes in 1883 had 3500 acres in wheat and 1200 in oats at Willowbridge and one year exported 175,000 bushels of wheat; at Waikakahi in the 1890's there were about 4000 acres in grain each year. Grain acreages were also large on Elworthy's Pareora estate and on the New Zealand and Australian Land Company's properties at the Levels, Acton, and Pareora.

On the large estates costs of production were very low—about 1s. 3d. per bushel at Longbeach and Acton and up to 1s. 8d. on rolling country at Pareora. As the wheat sold from 3s. 6d. to 4s. a bushel, the profitability of the trade can be realised. Much of the ploughing was done by contract, the usual rate being 5s. per acre, and when tussock land was being broken in the contractors usually received a fixed proportion of the crop.

Duncan Cameron of Springfield, near Methven, was one of the largest "bonanza" wheat producers. He was one of the first runholders to build water races and was also closely associated with the beginning of the frozen-meat trade.

Declining Yields

While virgin soils were available even the haphazard methods adopted on some properties gave payable returns, and under favourable conditions yields from cereal crops were high. It is reported that in 1880 70 bushels of barley per acre were threshed in many districts and yields of from 50 to 100 bushels of oats and 60 bushels of wheat were quite common. Nevertheless, though the average yield per acre varied from year to year, it was generally low and declined as the area was extended.

The growing of cereals often spread to unsuitable land and even there they were grown in a very short rotation. Green manuring was never practised and artificial fertilisers were practically unknown. Under such conditions it is not surprising that fertility declined. The average wheat yield in Canterbury dropped from 24 bushels per acre for the 5-year period 1881-1885 to 20 for the period 1891-1895. Average yields of oats dropped from 30 to 25 bushels over the same period.

The most popular wheat varieties were Tuscan (known in the export trade as New Zealand Longberry), Hunters, and Pearl (both called New Zealand Shortberry), though numerous others were introduced. Some of these found favour in certain districts, but little was heard of them beyond these districts and the farmers' knowledge of varieties was very limited.

Other Grain Crops

Though a large area of barley was grown, there appears to have been little choice of varieties, Peruvian and Kinver Chevalier being the ones most widely grown. Kinver Chevalier is still widely grown and has proved to be a good yielder and a high-quality malting variety.

For milling, the Potato oat was the most widely used and Black and White Tartarian were the most popular varieties for horse feed, it being claimed that they gave not only a greater amount of straw but also an increased grain yield of from 5 to 10 bushels over any other variety.

In many cases farmers paid little attention to the selection of suitable seed, and the average sample probably contained a high proportion of weeds as well as broken and shrivelled grain. Oats were a common impurity in wheat and frequently were the cause of lower prices for wheat. The rate of seeding generally recommended for wheat sowings was 1 bushel per acre, though heavier seedings were sometimes made.

Greenfeed crops were not widely grown, but the usual rate of seeding for oats and cape barley sown for this purpose was 1 bushel per acre, with a rather heavier rate when these crops were to be saved for seed.

The need for some type of seed treatment to control ball smut was soon recognised, and in 1881 Lincoln College carried out experiments to find out the optimum strength of bluestone pickle. In the previous season germination of seed wheat had been seriously affected by a dressing of about 8 to 10oz. per bag. For some time unsatisfactory results were obtained until it was found on analysis that some of the so-called bluestone on the market contained only 7 per cent. copper sulphate, the rest being sulphate of iron, which was of no use in treating ball smut.

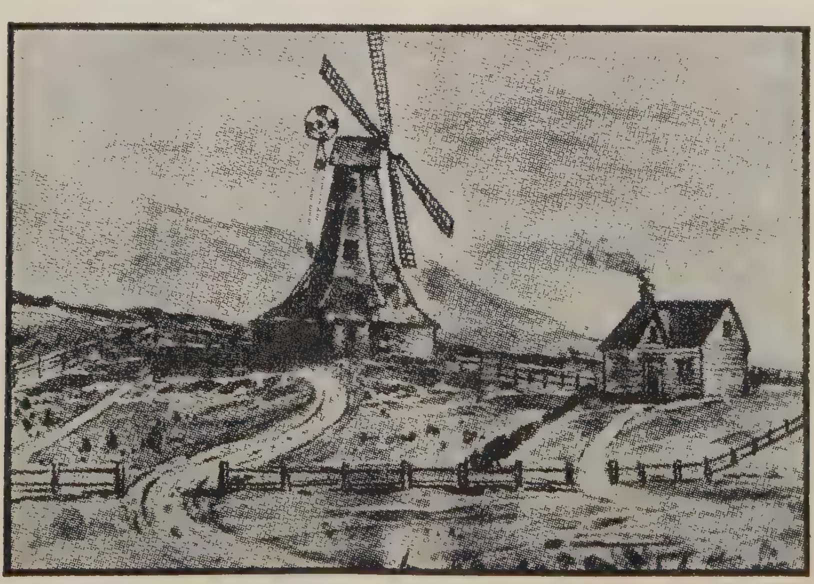
Early Pasture Mixtures

Though much land must have been laid down in pasture between 1870 and 1890, there was no general agreement about the correct mixtures to sow. A South Canterbury farmer writing in Brett's Colonists' Guide in 1883 recommended for a permanent pasture in his district a mixture made up of 15lb. of perennial ryegrass, 3lb. of Italian rygrass and cowgrass, 10lb. of cocksfoot, 2lb. of timothy, meadow foxtail, and red clover, 1lb. of crested dogstail, 3lb. of smooth-stalked meadow grass, 1lb. of alsike clover, and 5lb. of white clover, a total of 47lb. The same writer suggested for sowing down in March after the land had been under bare fallow all summer a mixture of 20lb. of ryegrass, 10lb. of cocksfoot, and 5 to 6lb. of clover. This is roughly similar to the mixture that Professor Wallace, writing in 1890, declared to be most common in New Zealand. According to him, cocksfoot was the most widely used European grass in New Zealand.

Akaroa Cocksfoot

Cocksfoot was introduced on Banks Peninsula as a pasture grass after the clearing of the bush and it soon became obvious that wonderful crops were produced. The first attempts at threshing it were made by Ebeneezer Hay, and after his death in 1863 his sons carried on. In 1867 Edwin Goodwin leased some land from the Hays; when the seed was very ripe it was threshed on canvas sheets with flails, a method that was generally adopted. By the 1870's farmers throughout the peninsula were saving large quantities of seed, 1874 being the first year with a really bumper crop. It is said that 120,000 sacks of cocksfoot seed at 80lb. to the sack were harvested. In spite of the difficult nature of much of Banks Peninsula, thousands of acres were ploughed (much of it after a bush burn) and in sown crops followed by grass, chiefly cocksfoot.

Charles Norman Orbell, manager of the New Zealand and Australian Land Company's Levels estate from 1876 to 1904. He devoted much time to sheep breeding, the Levels Corriedale stud being the oldest in New Zealand.



[From the 1900 jubilee number of the "Weekly Press", Christchurch.

One of the early Christchurch flour mills. By 1881 there were 39 mills in Canterbury, of which 19 were within a 30-mile radius of Christchurch.

From 1880 to 1900 cocksfoot production continued on a large scale. After reaching a very high level in the early 1900's production gradually declined, a trend that has continued up to today, though improved strains have been developed.

Value of Water Races

Though railways and roads provided access all over the plains, it was not until water races were constructed that the land could reach full productivity. The paradox of the situation was that huge quantities of water rushed down the beds of the rivers to the sea while the land between lay arid and bare. Subdividing was greatly hampered, as those properties which did not have a river frontage had no means of watering stock.

Charles Reed of Westerfield in the early 1870's was the first runholder to prove the value of water races, and he was followed by Duncan Cameron of Springfield, who in 1874 constructed a main race which ran for 13 miles from the intake; by 1880 he had almost 40 miles of races on his property. It was his example that stimulated the interest of county councils and road boards, the Courtenay Road Board beginning a scheme in 1877 which included a dam in the Kowhai River and a ½-mile tunnel through the hills; the scheme was later taken over by the Selwyn County Council, which reticulated much of the light land with a system of subdividing channelling. Further schemes were developed by the council, including the Waimakariri race begun in 1886.

After a poll of ratepayers had approved the scheme the Ashburton County Council began the construction of a water race system in 1880. Within

6 years 800 miles of races had been constructed at the extremely low cost of £2500 and ultimately the total length was raised to 2270 miles. For 3 years the council operated a 90-acre "irrigation farm" to demonstrate to farmers the use of the system and to experiment with different techniques. When "the benefits derived from irrigation were clearly demonstrated to the Council" the farm was sold.

In South Canterbury irrigation systems were on a smaller scale, the first scheme being proposed in 1882 for the Orari Plains by the Geraldine County Council. Steady progress was made until by 1908, 491 miles had been constructed; a further 231 miles were in use in the Counties of Levels, Mackenzie, and Waimate at the same date.

FLOUR MILLING

The early settlers milled the grain grown in their family plots with small hand mills like enlarged coffee grinders. The task was arduous and some of the more ingenious of the settlers contrived to harness the wind or streams to power their mills, the first successful one being William Webb, of Okains Bay, whose mill, with a good wind, could grind three sacks a day. Inwood's mill, opened in 1852, was the first commercial venture, and in 1853 three more were added, two water powered on the Avon and a windmill on the Heathcote. The millstones were about 4ft. in diameter and were worked horizontally in pairs, the lower one stationary and the upper rotating. About 200lb. of flour were ground per hour.

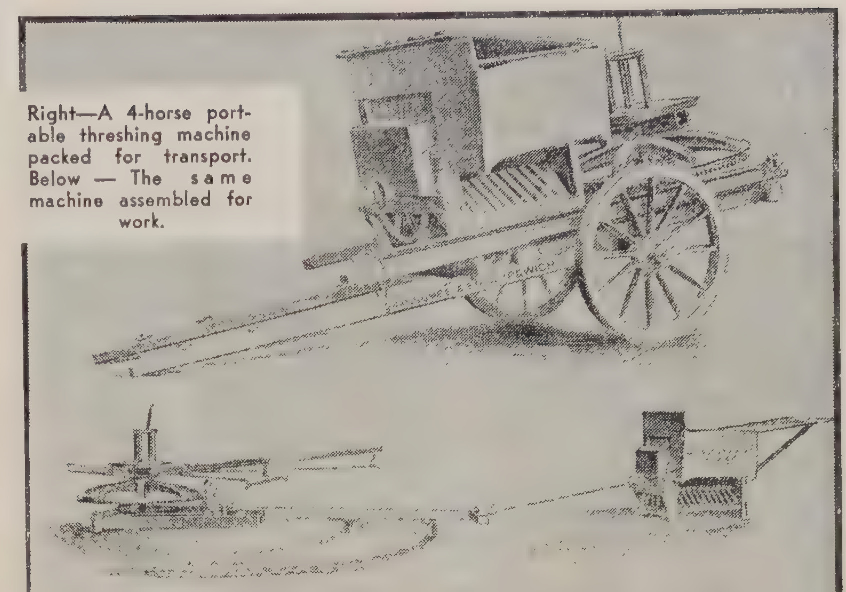
Most of the early mills were situated on streams and were driven by waterwheels developing about 5 h.p. A few were wind driven; one in Antigua Street was later moved to Leithfield, where it was destroyed by a severe gale in 1885. Another, Parr's mill, was erected in Timaru, but the motive power was too erratic and it was not successful.

By 1881 there were 39 mills in Canterbury, of which 26 were water driven and 10 steam driven. At one stage there were seven mills on the Avon, one on the Halswell, one at Lincoln, two on the water race at Darfield, two on the stream at Brookside and Irwell, one on the stream at Southbridge, two on the Southbrook stream at Rangiora, one on the Cam, one on the Cust, and one on the stream at Amberley; altogether there were 19 within a 30-mile radius of Christchurch besides those in Mid- and South Canterbury.

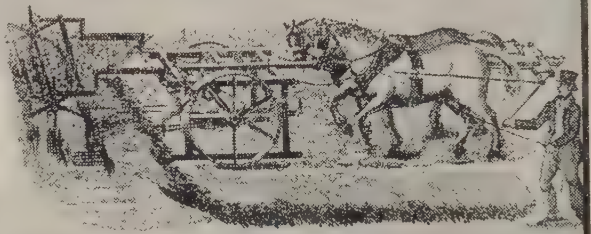
Introduction of Roller Mills

Millstones were used in New Zealand until 1882, by which date roller mills had been successfully operated in America and Europe for a long time, but New Zealand millers had declined to make any changes. The introduction of roller mills was largely the result of an accident. In 1881 Bruce's Waitangi mill at Timaru was burnt down and while his new mill was being built Bruce visited America and took with him samples of New Zealand wheat. After prolonged tests it was

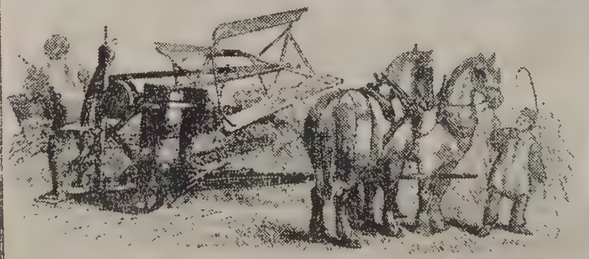
EARLY AGRICULTURAL MACHINERY



Right—A 4-horse portable threshing machine packed for transport. Below — The same machine assembled for work.

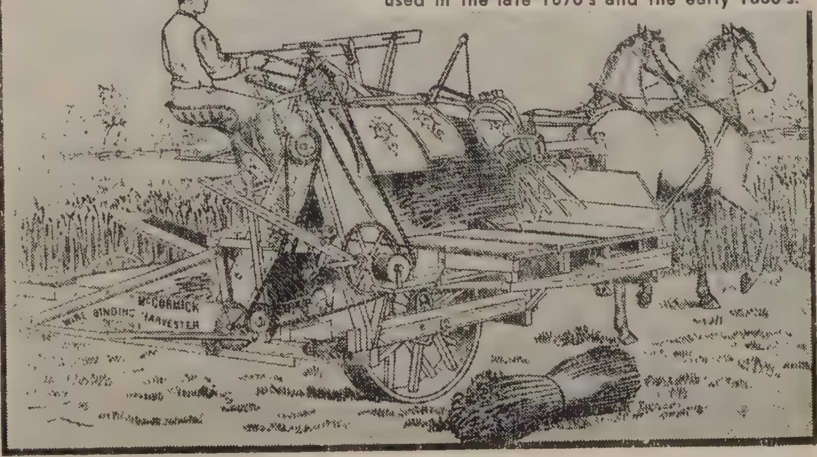


The Bell's "Improved Reaper", which was used on the Deans estate in the 1850's.

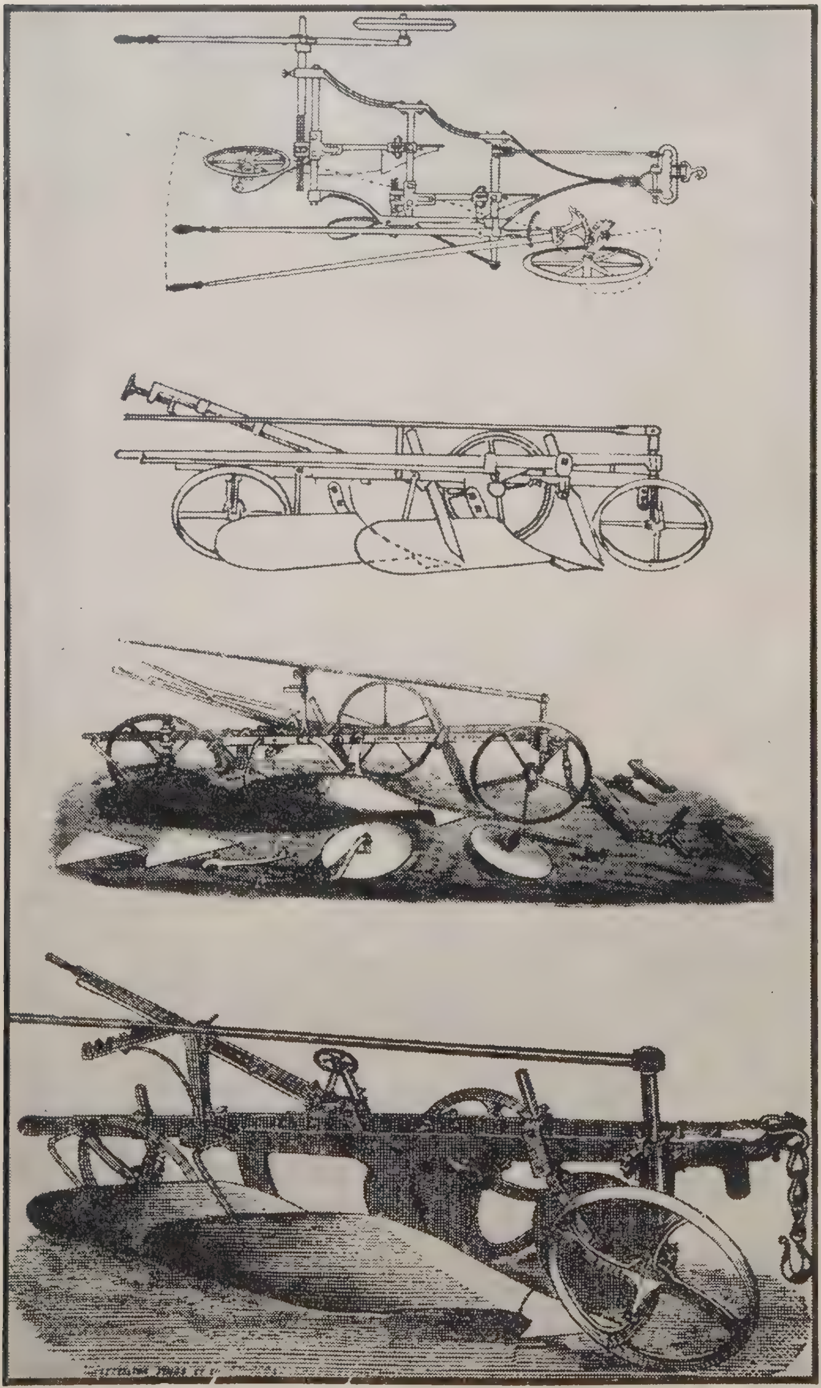


Left—As the Bell's "Improved Reaper" was a cumbersome machine, frequent changing of horses was necessary.

The McCormick harvester and wire binder used in the late 1870's and the early 1880's.



DEVELOPMENT OF "COLONIAL" PLOUGH



After Pirie's invention of the 3-wheeled plough in 1867 manufacturers soon adopted the principle and made their contributions to its improvement. John Gray's double-furrow, 3-wheeled plough was the model for Reid and Gray when they made their first "colonial" plough for John Grigg of Longbeach. Top—Pirie's original double-furrow, 3-wheeled plough, which he patented in 1867. Upper middle—The double-furrow, 3-wheeled plough made by John Gray and used by Reid and Gray as the pattern for their first "colonial" plough. Lower middle—A later model of John Gray's double-furrow, 3-wheeled plough. Bottom—A P. and D. Duncan Ltd. double-furrow plough which was widely used in the late 1870's and later.

found that roller mills could mill flour from New Zealand-grown wheat, though the moisture content was much higher than in American wheats. As a result Bruce decided to import a complete roller plant, and in September, 1882, the first roller-processed flour was produced in New Zealand. It became so popular that the mill could not cope with the demand even by working 140 hours a week; the plant turned out 2 tons of dressed flour per hour and in the first season produced 13,000 tons.

The new roller mills produced much better flour than the old stone mills; milling was much quicker and as steam replaced water as the motive power bigger mills were built. This, combined with the extension of railways, speeded up the change-over from the old to the new.

FARM MACHINERY

In 1843 the Deans brothers used a plough, a set of harrows, and 3 horses to break in their land at Riccarton, their only other tools being spades, mattocks, hoes, and rakes, with which they managed to plant over 7 acres of wheat, oats, barley, and potatoes in the first year.

Some idea of what implements a settler brought with him can be gained from a letter written by Thomas Tancred to John Deans in 1852. He proposed bringing an iron plough, an iron harrows, a 2-horse cultivator, a simple drill for corn and grass seed, a portable 2-horse threshing machine, a hand winnowing machine, and possibly a Hussey reaping machine.

As early as 1857 single- and double-furrow ploughs were being offered for sale in Canterbury and from 1863 onward the Canterbury Agricultural and Pastoral Association's show catalogues provide an interesting record of the plough's development, the growing number of exhibits by local makers showing how country blacksmiths were extending their range. The double-furrow handled plough was introduced into Canterbury in 1868 and was followed in 1875 by a 3-furrow model. Three years later the show catalogue mentioned a double-furrow plough—the lever plough—made by P. and D. Duncan, which marked a very great advance; it was this type of 3-wheeled plough which made possible the "bonanza" wheat farms of the 1870's and the 1880's. Pulled by a team of 3 horses (later 4 horses were used when the 4-horse yoke was developed) and light of draught, this plough could turn over 3½ to 4 acres of land in a day.

The "Colonial" Plough

The history of the "colonial" type of plough—the 3-wheeled lever plough—seems a little uncertain, but the following at least sheds some light on its invention and development.

At the Leicester show of the Royal Agricultural Society of England held from July 16 to 22, 1868, a trial of double-furrow ploughs was held and it is reported:—

> Two double-furrow ploughs were also put to work by Messrs. Howard and Ransome. Each had two horses attached, and the soil being extremely light (a vetch stubble), they both did their work beautifully and with perfect ease to the horses; in an ordinary texture of soil we believe the same work could be accomplished by three horses with similar ease, thereby saving one horse and one man.

> A like attempt was made with a double-furrow plough (2515) of very peculiar mechanism invented by Mr. Pirie of Scotland and manufactured by Messrs. Fowler and Co. Its work was very deficient in exactness compared with that of the two former, but the exhibitor having a single-furrow plough (2516) on the same principle, he particularly begged to have it tested and we therefore obliged him by placing it on similar conditions to those attaching to the General Purpose Plough. To furnish a correct test, we gave it two bouts in the dynamometrical trials; but we regret that in the case of this, a new inventor and exhibitor, we cannot speak more favourably of its work, the proof of draught by the dynamometer being much more than of the other ploughs tested.

This "peculiar mechanism" invented by Mr. Pirie, of Kinmudy, an Aberdeenshire mechanic, is important, for it embodied the entirely new principle of carrying the body of the plough on 3 wheels, one on the land and 2 bevelled ones running in the furrow to take the side thrust. By dispensing with both the side and sole plates, which formerly carried all the swing plough's weight and much of the 2-wheeled plough's weight, friction was lessened, with a resulting reduction in draught; the glazing of the bottom of the furrow and the tendency to develop a plough pan were almost completely obviated.

Further trials of the new type of lever plough compared with the old swing type were held near Edinburgh in 1869, the double-furrow ploughs fitted with oblique wheels proving more successful in every way. Each of the double ploughs was easily handled by one man and the work done by them was more than twice as great as that performed by the single ploughs. Interest in the tests was very widespread, which makes the failure of the new type to become popular in Scotland all the more surprising.

Thus in about 12 months Pirie's invention had developed into a workable plough and it is perhaps paradoxical that the recognition of his great invention came not from the country of his birth but from the colonies 12,000 miles away. A New Zealand visitor to Scotland in 1878 writing to a friend in Canterbury (the letter was published in "The New Zealand Country Journal", 1878) says:—

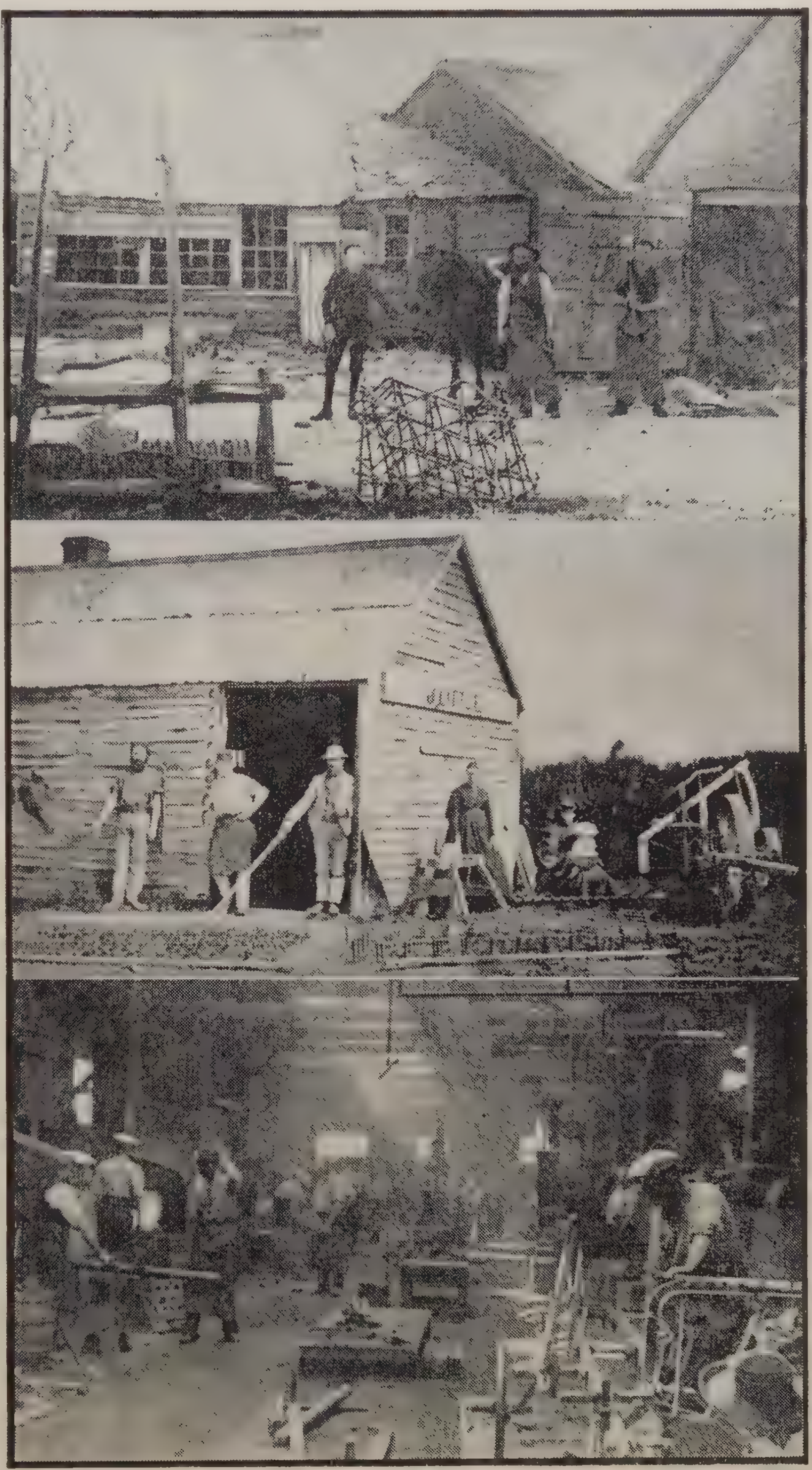
> You will agree that no implement so revolutionised farming in New Zealand as the two-furrow plough and the large harrows; in fact, the capability of one man to do the work of two has had a great deal to do with the advance of agriculture with you, the saving often permitting a fair profit where none would have otherwise existed. Now, in Scotland, the double-furrow plough is nowhere to be seen.

That contention is supported by George Gray, who in an address to the Bothwell Farmers' Society in Bellshill, published in the "North British Agriculturist" of August 17, 1893, said when speaking of Scottish ploughs:—

> About 30 years ago we had the double-furrow plough, but they were as quickly thrown aside, their greatest fault being probably their weight. Still, it is astonishing that on light and level soils, when the fields were large, they did not meet with greater favour, for in New Zealand they are the standard implement and have fairly monopolised the field.

In New Zealand, it was found that the early English and Scottish double-furrow ploughs were too light in construction. James Gray, the founder of Reid and Gray in Oamaru in 1868, first manufactured the double-furrow

LOCAL MANUFACTURE OF FARM IMPLEMENTS



The early blacksmiths soon became makers of farm implements and by the end of the last century the manufacture of farm machinery was a well-established industry. Upper—The smithy of Joseph Keetley, of Kaiapoi, who became well known for his ploughs. Middle—James Little's smithy at Woodend, which was started in 1867. Lower—The blacksmith's shop of P. and D. Duncan Ltd. in the early 1900's.

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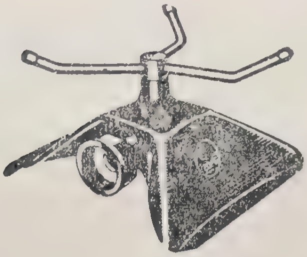

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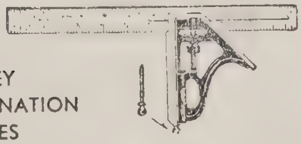

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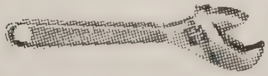

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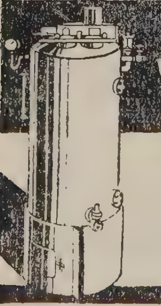

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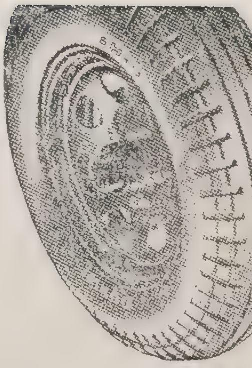

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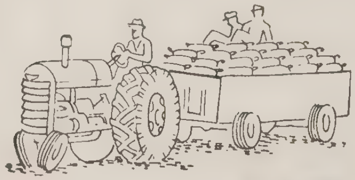

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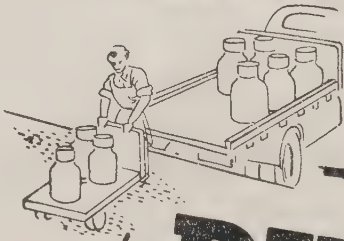

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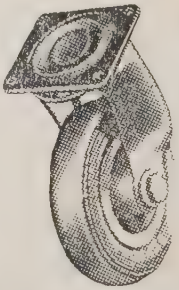

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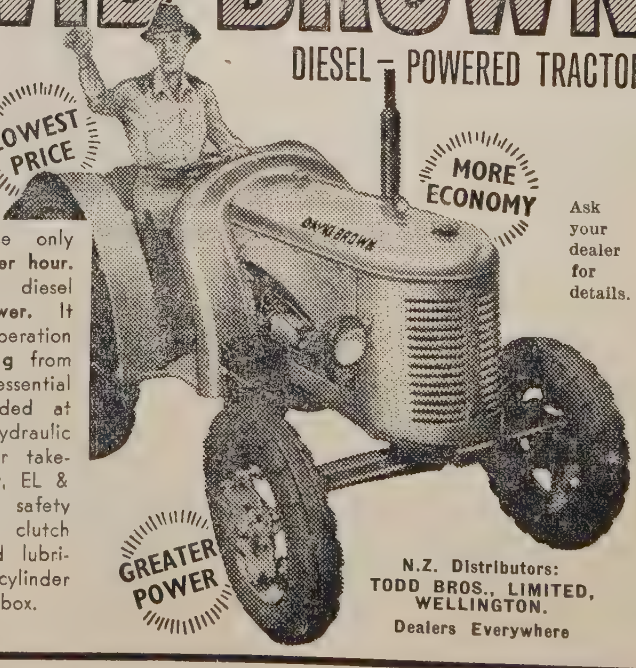

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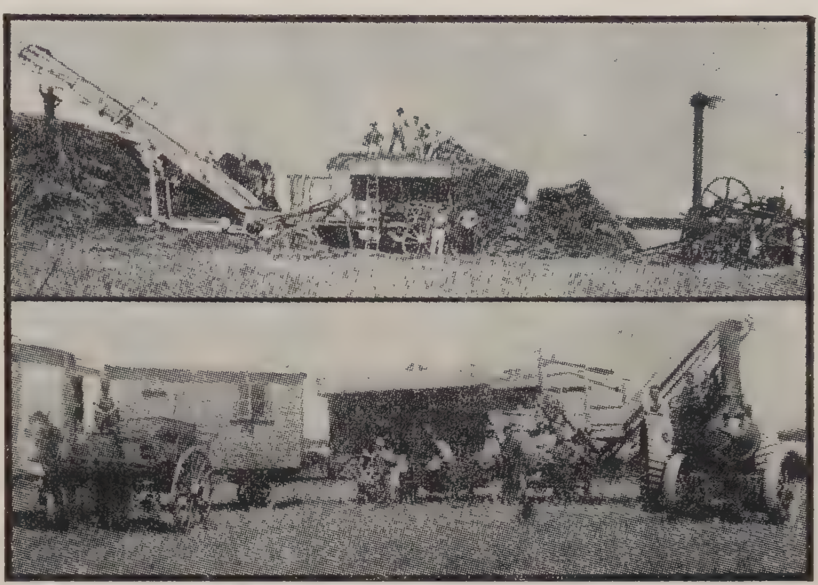


The first steam threshing machinery used in Canterbury was generally introduced in the 1870's. It consisted of a portable engine, mill, and separate elevator, as shown in the upper illustration, but during the next decade it was superseded by the traction engine and mill (lower).

"colonial" plough for John Grigg of Longbeach. This was later improved by both P. and D. Duncan and Reid and Gray, and double-furrow ploughs by both firms were used on Longbeach. The Rt. Hon. William Massey ploughed with both makes of ploughs when he was employed there.

The important features of this style of plough building as far as New Zealand was concerned were: first, that it formed the basis for the construction of strong, light-draught ploughs of from 1 to 3 mouldboards, of both walking and riding types, and subsequently of tractor ploughs from 1 to 5 furrows; secondly, it was a blacksmith's plough in that its body was of wrought iron on wheels of cast iron—a plough that could be made in the blacksmiths' shops and the foundries of a new colony only 30 years old.

Thus, in the 40 years after the first plough was pulled by bullocks in the fertile lands of the Canterbury Plains ploughs had advanced in construction and design until thousands of double-furrow ploughs drawn by 4-horse teams were at work and the 3-furrow model drawn by 6 horses attached by the block yoke had made its appearance and was to be the dominant ploughing arrangement until displaced by the tractor in the 1920's.

New Harvesting Methods

In the first stages of settlement all reaping was done by sickle or scythe and it was not until 1856 that the first machine, Bell's "Improved Reaper", was imported. It was used during the 1857 harvest in the Deans estate and "effected a great saving". Two years later a Burgess and Key reaper was brought out. The grain fell on a platform of the machine and was raked off by a man following behind, the sheaves being tied by hand. The McCormick and the Samuelson side-delivery reapers followed, the latter being the most efficient machine of its type.

The revolution in harvesting methods came with the introduction of the reaper and binder in 1877, the first machine, a Woods, tying the sheaves automatically with fine wire. The McCormick and the Osborne appeared on the scene soon after and in the end the McCormick displaced all rivals. Though the general use of wire binders marked a great advance, the danger to stock from pieces of wire in chaff was always present until the Appleby knotter was developed in America.

A threshing machine was brought to Canterbury in 1850 by Wentworth Cookson, "a four horse powered" machine which was not used very much. A different source of power was tried out in 1853 by John Deans when he brought from Scotland a water-power threshing machine which, after some mishaps, was installed in a stream and worked remarkably well. All these early machines threshed the grain from the crop and then the grain was winnowed by hand or put through a winnowing machine. When steam power became available in the 1860's the threshing mill and the winnower were built as one machine, forming the combine or threshing combine later known as the mill. One of the first mills was imported in 1865 with the earliest portable engine. All the early mills were small, light, and low, because they had to be manhandled into position at the threshing site.

Greater Use of Horses

During the first decade of settlement bullocks were used more frequently than horses for general farm work and for pulling wagons. Gradually the horse ousted the bullock both for ploughing and other cultivation work, for the slow-moving bullock could not be expected to plough the large areas then coming under cultivation. Bullocks were, however, used in the heavier work of stumping and hauling timber and heavy wagons of grain and wool. As communications became better and roads and bridges were formed they were displaced by horses; by 1880 bullocks were scarcely used at all. Horses and bullocks were used in the early stages of settlement to provide power for threshing machines, being harnessed to "horse powers" and, as they walked round in a circle, their power was transmitted through bevel or spur gears to a shaft and so by pulley and belting to the threshing mill. These "horse powers" were also used for grinding grain, making butter, cutting chaff, and winnowing or separating the chaff from the grain after threshing.

In the mid-1860's portable steam engines were introduced to New Zealand, one of the first being imported by Osborne and Rennie of Prebbleton. It was moved about the country by horses and was used mainly for driving threshing mills, which thus could be made larger. In 1878 a Hornsby steam engine and combine was exhibited at the A. and P. show, as was an agricultural locomotive, and 3 years later an Aveling and Porter 8 h.p. traction engine with rope, winding drum, and water lifter was selling for £460.

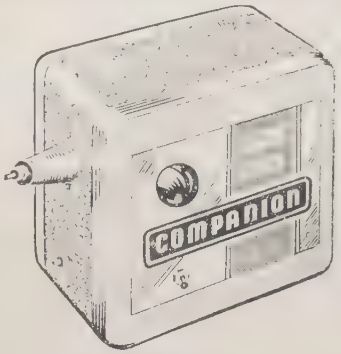
By 1880 the horse was almost universally the source of power on Canterbury farms and stations, bullocks were being replaced, wind and water power were used where convenient, steam power had been used for 15 years on farms for threshing, and the steam traction engine, a machine that was to extend greatly the limits of arable land in Canterbury, had made its appearance. Until this time development had been mainly on the drier tussock lands, but new methods were enabling the heavy, scrub-covered swamps to be tackled.

Broadcast sowing machines were exhibited in 1868, there being several models over the next few years, one of them being the Hornsby seed drill. The first American grain drill, the McSherry, a force-feed, 10-coulter machine, was imported in 1877. In the same period a number of other implements—mowers, horse rakes, and even a hedge-clipping machine—arrived.

Advances in Locally Made Implements

It is not surprising that the early blacksmiths soon graduated into makers of agricultural implements, one of the best known being Joseph Keetly, of Kaiapoi, who early acquired a reputation for ploughs which ranged from single- to 3-furrow models; besides these he made harrows, clod crushers, cultivators, rollers, "horse powers", and even "reaping machines with the latest improvements, specially adapted to the country and quite superseding those imported". Another blacksmith, James Little, of Woodend, early acquired a reputation for his harrows and light tine harrows. He also made chain and drag harrows, a double mould or drilling plough, and a potato lifter for fitting to a plough.

In addition to the advances in plough design and construction made by P.



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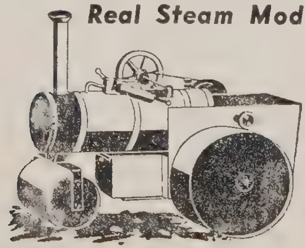

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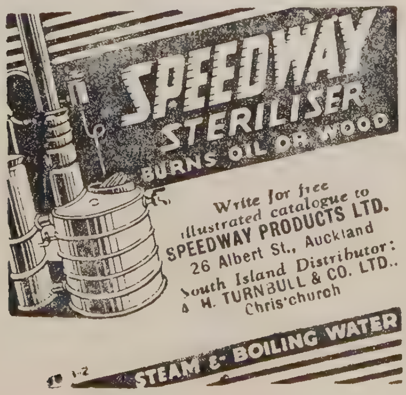

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and D. Duncan and Reid and Gray, new machines were brought to Canterbury farmers by a number of other firms. Morrow, Bassett and Co. introduced the Burgess and Key side-delivery reaper and in 1878 the McCormick wire binder, which proved so popular that 820 were sold in the first year. John Anderson arrived from Scotland in 1850 and built his forge at "The Bricks", commencing to make implements in a small way in 1857; he exhibited in 1868 a wool press and a reaping machine and a few years later a threshing machine. Later, Anderson's Canterbury Foundry turned to making heavy engineering equipment, though it made 50 threshing machines in all. Andrews and Beaven from 1878 onward developed the manufacture of chaffcutters, grass-seed cleaners, and other machines for preparing stock feed.

REFRIGERATION

As early as 1870 the problem of surplus stock was beginning to be felt in Canterbury and that year John Hayhurst started the first boiling-down works at Milford, near Temuka. About the same time the New Zealand Meat Preserving Company started a works at Washdyke; similar businesses were started at Templeton and Styx and a number of larger stations had their own. None of them was particularly successful, and those firms which attempted to can meat for export failed completely, much of the trouble being caused by the uncertain quality of the meat canned and the amount of mutton and offal lost.

Experiments had been going on overseas for some years in an endeavour to find some practicable way of freezing meat and in 1879 a cargo of frozen beef and mutton was successfully shipped from Sydney to London. In 1881 the New Zealand and Australian Land Company arranged for a shipment in the sailing ship Dunedin, which sailed from Port Chalmers at the beginning of 1882 with 5000 carcasses, most of them from the company's estate at Totara near Oamaru, but a few from Longbeach.

First Works at Belfast

Interest in the new experiment was widespread in Canterbury, and as early as 1881 the Canterbury Frozen Meat Company was formed. Some of the best-known runholders were included in its directorate. Works were constructed at Belfast in 1882 and slaughtering began in February, 1883, the first shipment being made in the British King in April of that year. The company in the first few years adhered rigidly to the rule of accepting nothing but prime wethers, prime lambs, and maiden ewes, though pressure from farmers compelled relaxation of the rule in 1890. Additions to the works were made in 1887, and in 1899 a new works was built at Fairfield and another in 1904 at Pareora.

The first ventures in meat freezing were made by the larger runholders and catered largely for their needs. The Canterbury Frozen Meat Company merely killed and froze the sheep; the owner was responsible for consigning them and disposing of them in London. For the smaller farmer with a limited supply of stock this system was not especially profitable, and in 1888 the Christchurch Frozen Meat Company was formed to cater for his needs by a system of pooling consignments. This company also pioneered another activity, the use of by-products, which had previously been wasted. In 1893 it took over the business of the South Canterbury Freezing Company at Timaru, the works being enlarged and renamed Smithfield.

Though the British market provided an almost unlimited demand for meat, New Zealand's exports in the first few years had to face a good deal of prejudice and it says much for the quality of Canterbury's exports that this opposition was broken down so early. Prices tended to fall during the 1880's and the high freight and insurance rates added to the meat producers' difficulties. Freight was then about 1¾d. per pound and with insurance the total was about 3d. per pound at a time when the meat was selling in London at 6d. to 7d. Frequent charges of monopolistic exploitation by the shipping companies were made, but by 1890 the total freight and insurance rate was down to 2d.; by 1897 freight alone was down to ½d.

Supremacy of Canterbury Lamb

When refrigeration was introduced Canterbury was fortunate in having large numbers of Merino and half-bred ewes which were mated to Leicester rams and produced lambs which matured fairly early and would fatten for killing. The British housewife demanded a small, lean, and tender joint and found Canterbury lamb the ideal in every way.

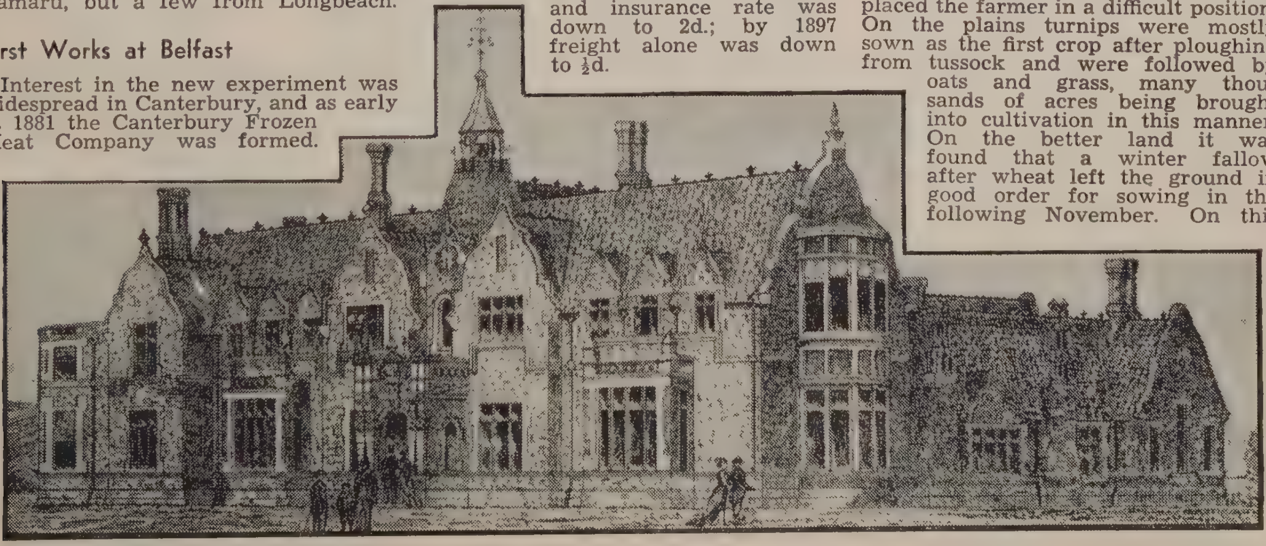
Canterbury took the lead as an exporter of frozen meat in 1886, when 161,000 mutton and lamb carcasses were dispatched; by 1891 the figure had risen to 691,000 and the total exports from Lyttelton and Timaru remained about this figure until 1900.

SUPPLEMENTARY FEEDING

The meat trade required the sheep to be in prime condition when slaughtered. Feeding practices improved with the fencing subdivision of properties which allowed the cultivation of good pastures, feed crops, and cereals in rotation. It was soon realised that in the climate of Canterbury supplementary feeding was necessary. Turnips were used from an early date and formed a most important part of the feeding programme, with soft turnips for late autumn, Green Globe for mid-winter, and swedes for late winter and early spring. Hay, oatsheaf chaff, cape barley, straw, kale, mangolds, and young grass were also used. Spring lambing utilised the flush growth of November and December and the lambs were finished on rape, which became the general crop for fattening and proved a splendid forerunner to the wheat crop.

Rape and Turnips

Initially many turnip crops were sown after a grain crop immediately after harvest, but it was found that this did not leave a long enough growing season. The crop often failed and the consequent loss of winter feed placed the farmer in a difficult position. On the plains turnips were mostly sown as the first crop after ploughing from tussock and were followed by oats and grass, many thousands of acres being brought into cultivation in this manner. On the better land it was found that a winter fallow after wheat left the ground in good order for sowing in the following November. On this



Lincoln College in 1880, the year it was opened. The need for agricultural education was realised early in Canterbury and the buildings of Lincoln College were begun in 1878.

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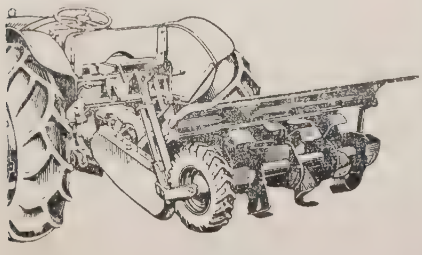

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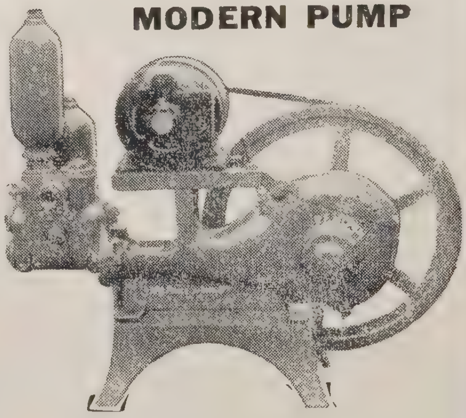

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(Chairman: Viscount Nuffield)

better land also a rotation of turnips out of lea, followed by wheat, oats, and then rape sown with grass, was found good practice and maintained the fertility of the land.

As early as 1883 the more progressive farmers were finding that early ploughing of the ground and winter fallowing gave much better results than did the practice of ploughing the stubble straight after harvesting and then sowing. No manure was used, though farmers were advised as early as 1880 to sow 1 or 2cwt. of bone meal with their turnips. Later, from 1890 onward, with an increasing range of manures available from freezing and boiling-down works, a little was used, as was some imported Japanese superphosphate. Locally made superphosphate was also used, there being a reference in the "Country Journal" in 1883 to an experiment with 1 ton of Mr. Moorhouse's superphosphate to 11 acres of turnips. The article concluded with the suggestion "that the application of superphosphate to light land will so increase its fertility that it will compare most favourably to land of excellent quality to which no manure has been applied".

Rates of seeding varied considerably from 2oz. to 4lb., but with experience 8oz. to 1lb. was found to give a good crop thick enough to be thinned out by cross harrowing. Undoubtedly, swedes were the first type to be introduced into Canterbury, but in the 1880's the most popular varieties on the plains were Red Top as well as Mammoth Purple Top; these gradually gave way to Green Globe.

Ravages of Insect Pests

Beetle damage to turnips was common and farmers were advised to use bone meal "to force the young plant up and into rough heart" so that it would be safe from attack. In 1886 and 1887 the turnip crops in Canterbury and elsewhere, but particularly in Canterbury, suffered from the ravages of the diamond-backed moth. In some cases the loss was up to 75 per cent. and caused much concern, for as one writer stated at the time, "Without the turnip, the trade in frozen meat could not be carried on to such an extent".

Until 1895 the official statistics gave combined figures for rape and turnips, the total area in 1880 being 85,000, acres; in 1890, it was 132,000 acres, rising to 202,000 acres in 1900.

THE MENACE OF RABBITS

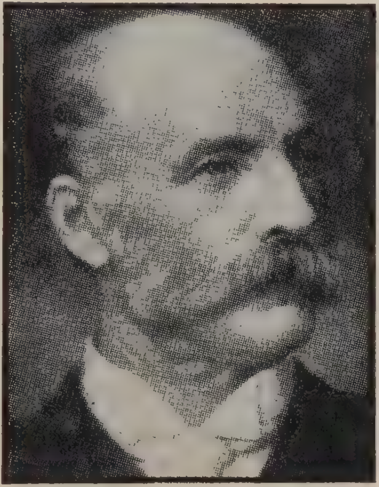
Refrigeration brought renewed hope to Canterbury's farmers; the danger of invasion of rabbits from the south threatened to dash their hopes to the ground.

Small colonies of rabbits were liberated in parts of Canterbury during the 1860's and 1870's, but did not cause any alarm, and it was not until Canterbury farmers had the warning example of Otago and Southland placed before them that complacency was destroyed. The first Rabbit Nuisance Act, passed in 1876, proved to be ineffective and in 1882 a new Act was passed providing for Government inspectors to supervise the destruction of rabbits and for the prosecution of those who failed to do so.

By 1886 the danger was much greater. A Parliamentary committee examining the problem was told by the Surveyor-General that "rabbits are spreading all along behind the Mackenzie Country and, judging from what happened in Otago and Southland, possibly a year or two hence they will come down in myriads on to the plains of Canterbury, unless efforts were made to check them".

The following year the Canterbury Chamber of Commerce and the Agricultural and Pastoral Association published a report on the danger, demanding that legislation be strengthened where necessary and that existing laws be enforced rigorously.

Meanwhile the expected invasion of South Canterbury was held up, although the rabbit inspector at Ashburton was sufficiently alarmed by the discovery of a colony of rabbits in the upper Rangitata to recommend the building of a rabbit-proof fence from the upper reaches of the river to the sea. But the same year (1887) the rabbit inspector at Timaru reported that his district was freer of rabbits than it had been for some time, though there was continual danger from a beachhead the rabbits had secured on the northern bank of the upper Waitaki.



W. E. Ivey, the first Director of Lincoln College. He vigorously criticised the predatory style of farming characteristic of New Zealand in 1880 and constantly endeavoured to spread a knowledge of new scientific advances.

To meet this danger the Government in 1887 began to construct a rabbit-proof fence running up the Hakataramea River and then northward to the Tekapo River, with a branch over to Lake Pukaki and another continuing up the Tasman River. It must have proved reasonably effective and the severe check the rabbits received during the great snowstorm of 1895 brought their advance to a halt. In the north the Hurunui fence proved an equally strong barrier.

AGRICULTURAL EDUCATION

The need for some form of education in agriculture was realised very early in the Canterbury settlement, and in 1872 the Provincial Council set aside 100,950 acres of pastoral land as an endowment for a school of agriculture. From the proceeds of the sale of part of this endowment a farm was purchased, buildings were constructed, and in 1880 the Lincoln School of Agriculture was opened with eight students in residence.

The first Director, W. E. Ivey, was a product of the Royal Agricultural College at Cirencester, Gloucestershire. The policy of this institution, founded in 1845, was that agriculture should be taught against an agricultural background and that a residential college closely associated with a farm was the proper setting for its teaching. Ivey endeavoured to carry out these precepts in New Zealand and was in the forefront of the agricultural revolution—the change from exploiting the land by continuous cropping to the building up of fertility by mixed farming, better cultivation, rotation of crops, and the use of fertilisers. Manurial trials, crop variety trials, the feeding of wheat to stock, the cross breeding of sheep, and general farm management all found a place in his early reports.

With George Grey, who was appointed Lecturer in Chemistry in 1883, Ivey worked for an improvement in the quality of fertilisers and was primarily responsible for the first Fertiliser Act of 1892. His successor was James Bayne, who extended the experimental work and was an early advocate of the Southdown ram for fat-lamb production.

Lincoln College was under the control of the Canterbury College Board of Governors, who were not themselves familiar with the problems of teaching agriculture. Dissatisfaction with this position and with the management of the college farm caused the Government to appoint a commission of inquiry which reported in 1888 in favour of separation from Canterbury College. Though this step was very necessary, it led to much controversy, and legislation making the change was not passed until 1896.

Most of the credit for the college's subsequent rehabilitation must go to William Lowrie, who was appointed Director in 1903. He reorganised the syllabus, brought the farm into good condition, and was a pioneer in the use of superphosphate with all crops. He was followed in 1909 by R. C. Alexander, under whose direction over the next 25 years the work of the college was widely extended.

During this period Hilgendorf began his work on seed selection, other scientific investigations were begun, the farm further improved, and the range of teaching expanded. In 1930 Canterbury Agricultural College was made a constituent college of the University of New Zealand, two chairs in agriculture and agricultural botany were established, and new laboratories were built.

Acknowledgment

Acknowledgment is made to Mrs. A. M. A. Ashley, Messrs. J. L. MacFarlane, C. R. Straubel, W. Bowman, and W. Little, and P. and D. Duncan Ltd., Reid and Gray Ltd., and the Canterbury A. and P. Association for the loan of material used to reproduce illustrations in this article.

Wairarapa Training Farm of Instruction

NEVER before has the demand for trained farm workers been as acute in New Zealand as it is today, and a sign of the times is the demand from youths anxious to acquire a practical knowledge of modern farming practice.

IN 1918 an area of 736 acres was acquired in the Wairarapa by gift and public donations amounting to £28,020, to which the Government contributed a further £9000, the intention of the donors being to develop the area as a training farm for returned men from the First World War and subsequently to set it aside for the training of youths desirous of taking up farm practice. The original proposal was put into operation and some 60 men received practical training in all phases of farming. Following that period the farm was used for various purposes in advancing the need for training in farm practice and after the Second World War it was again made available to returned servicemen. From January, 1944, 80 men have passed through the farm under the Rehabilitation Department's scheme and have been given an intense course in practical farm methods under the capable instruction of the farm manager, Mr. N. Blatchford, and his staff. The trustees and the members of the Rehabilitation Farming Committee consider that the training has been sound and the whole work well worth while.

The property is controlled by a board of trustees (all practical farmers) and a manager and staff responsible to the board. In August, 1948, the trustees decided to carry out extensive improvements and enlarge the activities of the farm so that a scheme for training youths between 15 and 18 could be undertaken. The scheme is now almost completed and the farm will be available to accept applications from such youths, beginning a course in January, 1951. As only a limited number of students can be accepted, applications should be made without delay. Training will occupy 2 years.

Farmed on Commercial Lines

The property is farmed on essentially commercial lines and the training will be practical, so that the trainee will acquire a complete knowledge of what he is doing and why. In addition short lectures will form part of the curriculum and a farm library is available.

Livestock consists of horses, some 2000 sheep, including stud Romneys and Southdowns, a Jersey herd, Polled Angus cattle, and purebred Large White pigs.

Field days, demonstrations, and visits to stud farms, A. and P. shows, etc., will form part of the training scheme.

Trainees will be under the personal supervision of practical and widely experienced foremen and will receive instruction in dairying, stock work, and other phases of agriculture and in horticulture.

All trainees join the local Young Farmers' Club and take part in its various activities, thus fitting them to take an active part in the Young Farmers' organisation when they go to another district.

There will be a system of marking to enable a true assessment of progress during the period of training. Revisionary tests will be given at 3-monthly intervals and quarterly reports covering progress, physical development, and behaviour will be furnished to parents.

During the 2 years boys are at the Wairarapa Training Farm they will receive 2s. pocket money per week in the first 3 months, 2s. 6d. in the second 3 months, 3s. in the third 3 months, 4s. in the fourth 3 months, and remuneration according to progress and results in the second year. The 3-monthly increase may be postponed or totally declined at the discretion of the farm training supervisor if the conduct and progress of a trainee are inconsistent with his ability. In addition to the pocket money paid a deferred payment of approximately £15 is paid annually. This payment is made to the boy's home address.

Included in the curriculum is provision for sport and recreation; football, tennis, cricket, hockey, swimming, and, during the winter, billiards, table tennis, dancing practice, physical culture, and social evenings.

Accommodation

Trainees are accommodated in separate cubicles, with ample shower and bath facilities. The recreation room, dining room, and kitchen are up to date and ample good food is provided.

When off duty trainees are under the supervision of a housemaster, a matron supervises the domestic arrangements and watches the health of the boys, and a resident doctor at Masterton is on call for any emergency.

Rules and Regulations

Rules and regulations are strictly enforced and must at all times be observed by trainees. Any wilful damage will be charged against the boy concerned and any serious breach of the rules makes him liable to immediate dismissal. Everything possible is done to see that the boys benefit during their period of training and are interested and happy during their stay.

List of Clothing

In addition to ordinary clothing, trainees must be provided with at least 2 suits for farm work, 2 pairs of heavy boots, a stock raincoat, 3 bath towels, 3 linen pillow slips, 4 single sheets. (All clothes and bed linen must be plainly marked with the trainee's full name.)

Application and Entry

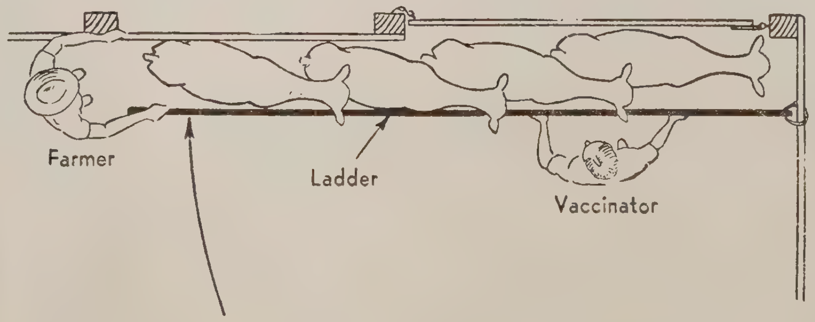
New trainees will be admitted toward the end of January. As accommodation is limited, early application is essential; if the number of candidates exceeds the vacancies, early applicants will receive priority.

The trustees will undertake, if desired, to find suitable employment for each boy at the completion of his training, provided his work and conduct have been satisfactory.

Any New Zealand youth between 15 and 18 who is interested in agriculture and has the necessary medical and character qualifications may become a trainee at the Wairarapa Training Farm of Instruction.

Applications for entry should be made to: The Secretary, P.O. Box 11, Masterton.

Handling Calves for Vaccination



THE Department of Agriculture asks farmers to provide suitable facilities for handling calves when officers call to do vaccination. Often much time is wasted because struggling animals have to be dealt with in corners of yards or in cow bails. Illustrated above is a simple method of holding several calves in the gateway corner of the cowyard, using an ordinary strong ladder one end of which is tied to the yard rails near the gatepost. Several calves are picked out from the mob and driven into the corner where they are firmly held by the ladder. After being vaccinated the calves can be let out into the outer yard or paddock.

—*E. NELSON, Assistant Inspector of Stock,*
Department of Agriculture, Palmerston North.

THE HOME GARDEN IN JANUARY

By S. O. GILLARD, Vegetable Instructor, Department of Agriculture, Auckland.

WEEDING is usually one of the most important garden tasks to be undertaken in January. Probably all gardeners have experienced the heartbreak of returning from Christmas holidays to find that weeds have practically taken charge of the garden. Once-neat rows of young seedlings will have disappeared in a sea of weed growth and even older plants are choked. Where the garden was kept very free of weeds during December the havoc will not be as great as where weeding had been less thorough, but much hard work will no doubt be necessary before order is restored. If hot, dry weather has been experienced during the Christmas period, the garden will in addition be parched and crops will suffer accordingly. Hand weeding is usually necessary and this will be facilitated if a good watering is given the night before weeding is to be done. When the soil is wet weeds may be removed more easily and with less damage to small plants.

WHEN the garden has been cleared of all weed growth which accumulated during the holiday season further control of weeds will be found relatively easy, because the hot sun will cause them to die rapidly after cultivation. Continued weeding is necessary, because considerable transpiration of moisture can occur through the leaves of weeds and this can seriously deplete soil moisture during dry weather. Two further important aspects of weed control are: That if weeds are allowed to seed, the weed population may be greatly increased next season, and that weeds are hosts of many pests and diseases which affect vegetables. It is sound gardening practice to keep the hoe going among growing crops.

Though by January the garden should be almost filled with newly planted, growing, and maturing crops and little spare ground will be available, many crops can be sown or planted this month. Dwarf beans, peas, radish, lettuce, spinach, silver beet, beetroot, carrots, turnips, and swedes may all be sown and savoy cabbage, brussels sprouts, and leeks may be planted in most districts. It is not yet too late to sow parsnips in the warmer districts and small plantings of tomatoes and sweet corn for late crops can still be made in Auckland districts free of frosts until late May.

Liquid Manure

The use of liquid manure will give an added fillip to growing crops, and salad crops, which should be grown rapidly, especially will benefit. Liquid manure can be made easily by suspending a quantity of animal manure in a sack in a tub of water; from 1 to 2lb. of fresh animal manure per gallon of water should be sufficient. Other useful liquid manures are sulphate of ammonia and nitrate of soda at 1oz. to 4 gallons of water.

General work in the garden will include attention to tomato plants which require tying to supports and the removal of laterals from tomatoes. Mature potato crops should not be left in the ground after the tops have died and those still growing should be kept earthed up; the potato tuber moth may cause damage to both growing and mature crops if this is not done.

The runners of kumaras should be lifted periodically to prevent them from rooting.

Disease Control

Many crops will require protection from insect and disease attack at this time of the year. Where late blight of tomatoes and potatoes is troublesome infection may be prevented by regular applications of Bordeaux mixture 3 : 4 : 50 or of copper oxychloride at 1lb. to 20 gallons of water. Arsenate of lead 2oz. to 5 gallons of water or D.D.T. 1oz. to 6 gallons of water will prevent damage to tomatoes by caterpillars.

To protect the young cobs of corn from attacks by the corn ear worm. D.D.T. may be applied as a spray. using 1oz. of wettable 50 per cent. powder to 6 gallons, or as a dust.

White butterfly and diamond-backed moth are extremely troublesome in brassica crops at this time of the year and regular applications of D.D.T. will be necessary to protect the crops.

Watering

From early January until autumn rains commence, watering is necessary in most gardens to keep plants growing and to provide sufficient moisture to develop the crops fully.

Heading photograph by Green and Hahn Ltd.

THE HOME GARDEN IN JANUARY

[*Green and Hahn Ltd. photo.*

If onion bulbs are fully grown, ripening may be induced by bending the tops. This is recommended only if there is a prolonged spell of wet weather when the onions are ready to harvest. It is better to allow the crop to ripen naturally before it is pulled out of the soil.

Most home gardeners realise the need for supplying water to the plants, but the importance of correct application is less well understood, nor are all gardeners aware that a good deal can be done to conserve moisture in the soil and thus save much time and water.

Because water becomes short in many localities in summer, local bodies are obliged to impose restrictions, and there is a tendency to skimp watering, giving a light sprinkling over a large area.

Though light watering is better than none, it is a wasteful and often almost useless way of attempting to keep plants going. In hot weather most plants get their roots down as deep as possible, trying to reach moisture well below the dried-out surface soil.

A small quantity of water, which wets only the top ½in. or so of soil, reaches very few roots and therefore fails in its main objective. In addition, the topsoil is warmest, is exposed to the effects of sun and wind, and consequently dries out very quickly. Therefore, a large proportion of the water in the top layer of soil instead of sinking in and assisting growth evaporates soon after it is applied and much of its value is lost.

Another reason why light watering is resorted to is that experience seems to suggest that frequent watering is necessary. That is quite true when insufficient quantities are used, but less frequent and more penetrating waterings are very much more beneficial.

By giving enough water to moisten the soil to a depth of 3 or 4in. much better results are obtained. In the first place, some reaches the roots immediately. Secondly, because the water has gone down to a greater depth, less is lost through evaporation by sun and wind. The soil will be cooled to some extent, thus further reducing the rate of evaporation, and some water is likely to penetrate a little deeper after a few hours. Finally, watering can be done much less frequently than where light sprinklings are given.

Effective watering of the whole garden takes no longer (probably less time) than frequent sprinkling and the results are very much better. The method of working is quite simple. Instead of hurrying quickly over the whole garden at one time and then repeating the same faulty procedure at intervals of a few days, give part of the garden a thorough watering. Start before the whole area is parched and there will be no need to hurry the work unduly. If the garden is very dry, water small seedlings and shallow-rooting plants first; then go on to the hardier ones. Water part of the garden each day, or if the section is small, do some each second or third day. Work out a programme which will allow the whole area to be watered in 10 to 14 days, with perhaps an extra watering for very dry places or for newly established plants.

Mulching

Mulching vegetable plants is an advantage, as it obviates much of the hard work of weeding and cultivating. Mulches keep the soil cool during hot weather, smother small weeds, conserve and maintain a more uniform supply of moisture for the plants, and make it possible for the roots of plants to feed in the upper 2 to 3in. of soil. Mulches are suitable for tomatoes, peppers, egg plants, celery, lettuces, and many other crops grown during summer.

Materials commonly used for mulching are grass and soft hedge clippings, straw, old hay, sawdust, or similar materials. Strawy stable manure, if procurable, also makes a good mulch and, in addition, contains readily available plant foods.

Mulching materials should not be applied early in the season before the soil has warmed up sufficiently and plants are growing freely or before the garden has been cultivated to suppress the early weed growth.

The amount and thickness of the mulch will depend upon the kind of material used; enough material should be applied to prevent any weed growth from pushing through it. Three inches of straw or old hay may be necessary, but a 1 or 2in. layer of grass or hedge clippings or sawdust will be sufficient.

Materials that are readily available near the garden or can be purchased at a reasonable price should be used.

Protecting Very Young Seedlings

One method of protecting very young seedlings is to sow seeds a little deeper in dry weather. Their roots then get down to moist soil more quickly and the tender shoots are protected to some extent when they emerge from the seed coverings. Another method is to cover the row with sacks as soon as the seeds are sown. The sacks reduce the rate of evaporation of soil moisture and also keep the soil a little cooler. As seeds germinate very quickly and evenly under the sacks, a close watch must be kept, because the sacks should be taken away as soon as the young plants appear or seedlings will become spindly and weak.

[*Sparrow Industrial Pictures Ltd. photo.*

The quality of kohl rabi is best when plants are grown to mature in autumn and early winter. If left to grow to full size, bulbs become tough and stringy.

[*Sparrow Industrial Pictures Ltd. photo.*

As good quality in sweet corn is obtained for only a short period in a planting of any variety, close attention must be given to harvesting the cobs.

An improvement on the latter method is to arrange a low "tent" of sacking along the rows as illustrated on this page instead of laying sacks on the ground. If this is done, it is not quite so important to remove the covering as soon as the seedlings come through, but the "tents" should be taken away within 24 hours of that time if possible, to allow the young plants to harden properly.

A fourth method is to cover the rows immediately after they are sown with a light mulch of fine lawn clippings, using sufficient to give complete coverage of the soil along the rows. This method is unsuitable for small seeds such as carrot and lettuce, but is excellent for stronger seedlings like peas and beans.

Lettuce

Lettuce is undoubtedly the most popular of the salad crops and finds a place in most home gardens, particularly this month, when crisp, fresh greens for salads are very welcome. Lettuce is a cool-weather plant and does best when day temperatures are not high and night temperatures are cool. At this time of the year it is difficult to secure firm, compact heads and the plants have a tendency to bolt to seed instead of hearting. The plants should be kept growing steadily and without any checks from dry, hot conditions, which tend to make them bolt.

To keep the soil cool and moist it is a good plan to mulch the rows of lettuces with material such as lawn mowings, light hedge clippings, sawdust, or compost.

As lettuce plants do not transplant satisfactorily in the hot months, it is advisable to sow seed ¼in. deep where it is intended to grow the plants and thin seedlings to 6 to 9in. apart.

As lettuces are subject to scorching if watered overhead in bright sunshine during hot weather, it is advisable to water them in the cool of the evening or to irrigate by using small furrows along which the water is allowed to flow between the rows of plants. Watering should cease as the plants near maturity to prevent the heads from splitting.

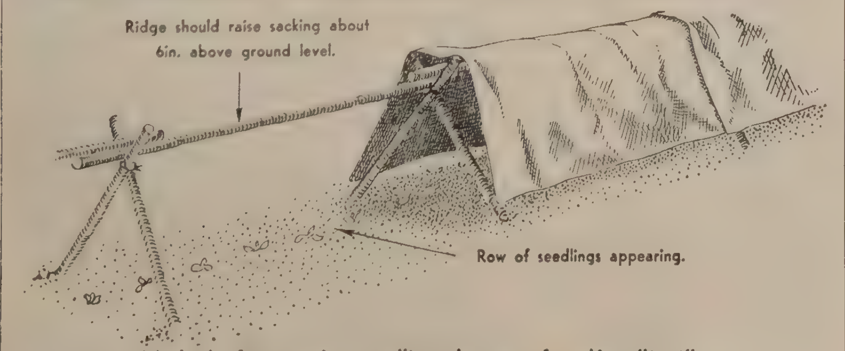
Suitable varieties for sowing at this time of year are Great Lakes and Imperial 847 and Neapolitan and Champion Cabbage in districts where conditions are cooler.

Potatoes

In northern districts free from early frosts a small planting may be made of early-maturing potatoes such as Epicure or Arran Banner. Late planting is not always successful, as much depends on the weather, but where space permits it is worth a trial.

Kohl Rabi

Kohl rabi (turnip-rooted cabbage) is grown for the turnip-like enlargement of the stem above ground. It is not commonly grown in home gardens, although it is an excellent vegetable if used before it becomes tough and stringy. For good quality, growth should be rapid and without checks. Kohl rabi may be sown from early spring to February, but January sowing is most favoured, as the crop then matures in late autumn, when other vegetables are becoming scarce. A rich garden soil will produce excellent kohl rabi. Like cabbage it will not do well on an acid soil, and if this condition exists, it should be corrected by applying carbonate of lime at 4oz. to a square yard.


Ridge should raise sacking about 6in. above ground level.
Row of seedlings appearing.

Method of protecting seedlings by use of sacking "tent".

As kohl rabi does not transplant readily, it is best sown in the permanent position. Sow seed thinly ½in. deep in rows 18in. apart and thin plants to 6 to 8in. apart in the rows. A fertiliser containing 2 parts of blood and bone, 1 part of superphosphate, and 1/20 part of sulphate of potash, all by weight, applied at the rate of 4oz. per square yard should be worked into the soil several days before planting.

Care should be taken when cultivating to keep the earth from the heart of the plant and not to cover the bulb. The bulb-like stems should be ready for use about 4 months after the seed was sown and should be harvested for use before they are fully matured and when not more than 3 to 4in. in diameter, as they become coarse and of inferior quality when allowed to grow too large.

Varieties: A very popular variety is White Vienna, an early dwarf which is excellent for home gardens. The bulbs are globular and very light green and the flesh is clear white, tender, and crisp. Purple Vienna takes about a week longer to mature than the white variety; the bulbs and leaves are purplish and the flesh greenish white.

Peas

In most districts January is the latest month for sowing peas to mature before winter. A quick-maturing variety should be chosen, and for southern districts sowings should be made early in the month, because although peas prefer cool conditions, they will not grow in cold weather. They do best in fertile, moist, deeply cultivated soils and usually do well after a crop that was

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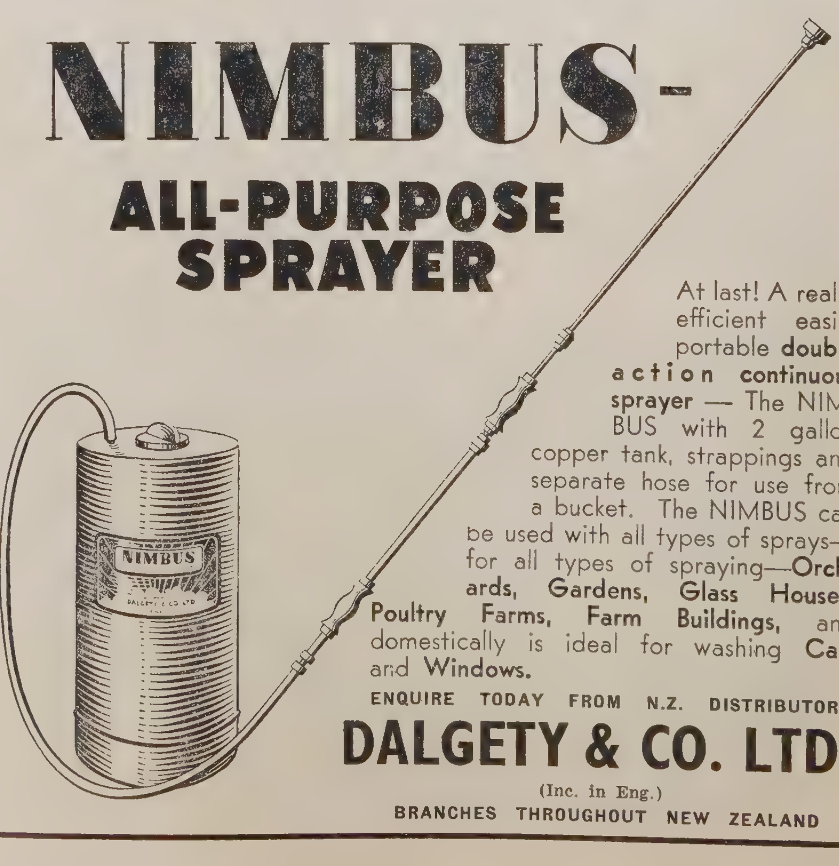

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well manured. If the soil is poor, a mixture of equal parts by weight of blood and bone and superphosphate and 1/20 part of sulphate of potash applied at 4oz. a square yard and thoroughly worked into the soil will be beneficial. Do not be too generous with the manure, because heavy manuring, particularly with nitrogenous organic manures, tends to promote excessive vegetative or straw growth and makes the crop more liable to disease. Peas, like most vegetable crops, do not grow well on acid soils and most soils will benefit from an annual dressing of 4oz. of carbonate of lime a square yard. Drills spaced 2ft. 6in. apart should be drawn 2½ to 3in. deep with a hoe and the peas scattered the width of the drill; allow from 1 to 2in. between the seeds. Dwarf varieties grown at this season of the year seldom require supports; drawing up the soil to them is usually sufficient.

Suitable varieties for sowing now are: Earlicrop, William Massey, Little Marvel, Utility, and Blue Bantam.

[*Sparrow Industrial Pictures Ltd. photo.*

Banana squash grows similarly to the pumpkin. It is of good flavour and dry when cooked, with a deep orange flesh. It is an excellent keeper.

Beetroot

Though beetroot can be sown in northern districts as late as March, further south, where frosts are earlier and generally heavier, it is usually advantageous to sow early to allow time for bulb development.

Beet is not particular as to soil and good crops can be grown in almost any well-worked and well-drained soil containing humus and not lacking lime. A soil that was heavily manured for a previous crop is excellent, but if plant foods are thought to be lacking, the addition of a mixture of 1 part of blood and bone, 2 parts of superphosphate, and 1/20 part of sulphate or muriate of potash, all by weight, at the rate of 4oz. a square yard will be suitable for most soils.

Seed should be sown ½in. deep in rows 12in. apart and the plants subsequently thinned to 3 to 4in. apart in the rows. Provided conditions are not too hot or dry, seedlings removed during thinning may be used for transplanting to another bed. They should be well watered after being set out.

Varieties

Types of beetroot and varieties of each type (with maturity period of the variety in days shown in parentheses) are as follows:—

Flat: Egyptian, Early Wonder (52).

Round or globular: Crimson Globe, Derwent Globe, Detroit Dark Red (60).

Half-long: Obelisk (65).

Long: Long Smooth Red, Long Dark Blood (78).

Recommended varieties for January planting are Early Wonder and Derwent Globe.

[*Photo News Ltd. photo.*

Beetroot is a useful vegetable at any period of the year, and to have good-quality bulbs available, successive sowings should be made from early spring to March.

Swedes

In northern districts and where soil moisture can be maintained and a fairly long growing season is assured seed of swede turnips can still be sown as advised in last month's "Journal". Swedes are easy to grow, are high yielding, and have a higher food value than ordinary turnips. If sown now, they will be harvested before reaching full maturity and will be found of superior flavour to earlier-sown ones. Swedes are of especial value, as they will keep in good condition throughout winter.

A quick-maturing variety is Garden Swede.

Parsnips

Tender well-grown parsnips are popular, and although they require a long season of growth to develop to their full size, seed of the Oxheart variety sown now as advised in last month's "Journal" will produce sizable roots by winter.

Chinese Cabbage

Chinese cabbage is not grown to a great extent by home gardeners and is often considered a new vegetable. It is probably a native of China, where it has been cultivated since the fifth century. It is a useful vegetable and deserves a place in the home garden. The leaves are stripped from the midribs and boiled like spinach and the midribs may be cooked and served like celery or asparagus. Chinese cabbage can also be eaten raw like lettuce.

Chinese cabbage is an annual and has few characteristics of common cabbage. Two distinct species are grown: Pakchoi and Pe Tsai. The Pakchoi varieties resemble silver beet in habit of growth. The leaves are long, dark green, and oval. This type does not form a solid head. Pe Tsai varieties are somewhat like cos lettuce, but produce a much larger and longer head which is compact; the leaves are slightly wrinkled, green, thin, and thickly veined with a broad midrib.

[Photos by Green and Hahn Ltd. (left) and Sparrow Industrial Pictures Ltd. (right).

New Zealand spinach (left) and tampala (right) are good substitutes for true spinach and grow well in hot, dry weather, when true spinach is difficult to produce.

As it thrives best during the cooler portion of the growing season, Chinese cabbage when sown in spring often fails to form desirable heads. Seed sown now should produce a good crop. Seed may be sown where the crop is to mature or it may be planted in a seedling bed and the plants transplanted out like cabbage. It is important, however, to prevent a check in growth, and for this reason the plants should not be allowed to get too large before being set out. At this period it is best to sow the seed where the crop is to mature, and after the plants become established they should be thinned to 15in. apart. Seed should be set ½in. deep in rows 24in. apart.

Although a good loam is preferable, any rich soil retentive of moisture and in good physical condition will produce satisfactory results with ordinary care and attention. A fertiliser containing 2 parts of blood and bone, 1 part of superphosphate, and 1/20 part of sulphate of potash, all by weight, should be applied at the rate of 1lb. per square yard and well worked in before planting.

The most popular varieties are Chihili and Wong Bok.

Spinach Substitutes

Two excellent substitutes for spinach which can be sown now are tampala and New Zealand spinach (*Tetrangonia expansa*). Both do well where conditions are too hot and dry for ordinary spinach. They are vigorous growers and are preferred by many to ordinary spinach.

New Zealand spinach is not a true spinach, but the leaves resemble those of spinach and are used in the same way. The plants have a spreading habit and branches may be to 3 or 4ft. across and grow to a height of 1 to 2ft. The leaves are thick, dark green, and somewhat triangular. The tips of the branches are used, and since these do not touch the soil, there is no soil to be washed off and no waste in preparing them for the table. Seeds of New Zealand spinach should be sown in groups of three 1 to 1½in. deep (depending upon whether the soil is heavy or light); groups should be at least 2ft. apart each way. Germination is often slow and seed may be soaked 12 hours before planting to promote faster germination. When the plants have become established each group of three should be thinned to one strong plant.

Tampala is a frost-tender plant which takes 6 to 8 weeks to reach usable size. The plants may grow 2ft. or more high and repeated pickings can be made. Greens gathered from tall plants are free from the soil splashes so common on ordinary spinach. Tampala does not bolt to seed in hot weather as does ordinary spinach. Seed should be sown ½in. deep in rows 18in. apart and the plants thinned to 12in. apart in the rows.

Both New Zealand spinach and tampala require a rich, well-worked soil which has previously received a dressing of lime. For most soils a good general fertiliser mixture is equal parts of blood and bone and superphosphate plus sulphate of potash equal to 5 per cent. of the weight of the first two manures. The fertiliser should be broadcast and worked into the soil several days before sowing at the rate of 4 to 8oz. a square yard.

Tampala is obtainable in two varieties; one has green leaves and the other green variegated with red.

◆

METEOROLOGICAL RECORDS FOR OCTOBER

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	57.3	+ 2.1	72.2	38.0	4.18	17		1.03	29	162.7
Auckland	160	59.6	+ 2.4	71.9	46.4	4.68	17	+ 0.67	0.90	3	180.3
Tauranga	10	57.5	+ 1.6	73.8	37.2	4.64	15	— 0.30	1.07	4	199.5
Ruakura	131	56.3	+ 1.5	74.5	34.0	3.64	13	— 0.37	0.78	16	174.2
Rotorua	980	55.6	+ 2.6	74.0	35.0	5.02	13	+ 0.02	1.50	16	169.1
Gisborne	12	56.2	— 0.1	75.2	38.8	9.38	19	+ 7.14	2.41	4	175.1
New Plymouth ..	160	55.8	+ 1.5	71.0	33.1	5.39	11	— 0.18	1.86	29	188.2
Napier	5	56.4	+ 0.0	77.0	36.7	3.00	15	+ 1.08	0.91	4	177.0
Taihape	2157	51.7	+ 1.9	68.2	34.8	3.31	12	— 0.05	1.02	16	
Wanganui	72	56.2	+ 1.4	74.5	40.8	2.53	11	— 0.82	0.81	16	205.6
Palmerston North .	110	55.4	+ 1.6	73.0	33.2	2.32	10	— 1.23	1.09	16	205.3
Waingawa	350	53.5	+ 0.5	73.5	30.5	3.81	13	— 0.91	2.12	16	184.5
Wellington ..	415	53.2	+ 0.2	67.2	41.5	6.84	10	+ 2.95	2.80	16	192.3
Nelson	24	56.2	+ 2.1	72.3	38.7	2.05	7	— 1.49	0.91	15	241.0
Blenheim	12	54.2	+ 0.0	82.2	32.8	1.54	6	— 0.61	0.75	15	216.2
Hokitika	12	52.8	+ 2.0	67.0	30.6	4.46	13	— 6.90	1.21	28	237.7
Hanmer Springs ..	1225	51.2	+ 0.6	76.0	28.2	4.99	10	+ 1.10	1.49	16	167.5
Christchurch ..	22	53.9	+ 0.9	78.0	33.2	3.77	11	+ 1.91	1.75	30	167.5
Ashburton	323	52.6	+ 1.0	77.6	33.0	5.19	8	+ 2.99	2.22	30	176.9
Timaru	56	53.6	+ 1.0	82.6	32.8	3.86	19	+ 2.00	1.50	30	159.6
Alexandra	520	55.6	+ 3.4	76.5	28.9	1.85	11	+ 0.62	0.49	29	201.3
Taieri	80	52.6	+ 1.5	73.9	30.2	1.36	14	— 0.83	0.51	29	181.3
Invercargill ..	32	53.5	+ 3.3	77.0	33.0	2.55	10	— 1.03	0.60	15	164.2

GRASSLAND CONFERENCE IN SOUTHLAND

FARMERS from Southland, Otago, Canterbury, and even further afield, and research and extension workers from many parts of New Zealand must have benefited considerably from the papers, discussions, and visits to farms that were arranged for the 12th annual conference of the New Zealand Grassland Association in Invercargill on November 1, 2, and 3. Delegates from ancillary industries such as fertiliser manufacturing companies and the seed trade also attended.

Mr. D. Macpherson addressing delegates when they attended his farm at Waianiwa on the afternoon of the first day of the Grassland Association's conference.

THE series of papers was arranged so that in the first two days subjects of particular interest to Southland were presented in a chronological order beginning with the formation of the soils of the district and extending through the evolution of farming in Southland from utilisation of the native tussock vegetation to its present status as largely intensive grassland farming.

Open Forums

The large attendances at the sessions of the conference were intensely interested in the technical papers, and subsequent open forum discussions had frequently to be arbitrarily closed to allow proceedings to continue.

Two excellent papers given by local farmers allowed technical workers to ask pertinent questions of practical men, and additional value was received from these discussions during subsequent visits to the properties of these farmers.

It was obvious that the open debates after each paper were most appreciated, and length of papers might have been restricted with advantage to enable fuller opportunity for all those wishing to add to the discussion.

Fuller participation of practical farmers in the programme of papers and shorter papers to allow of more discussion might add to the value of future conferences.

There can be no gainsaying, however, that the aim of the conference in stimulating discussion of the district's agricultural problems between technical men and practical farmers on a common ground was achieved. That there were sharp differences of opinion and some inconclusive debate was a measure of success rather than failure. There was an impression that each side went away with something to think about.

Some Impressions

Some impressions of the conference were that the great increases in carrying capacity achieved by the intensive liming and draining programme of the past 20 to 30 years in Southland had been accompanied by several major problems. For solutions to or alleviation of some of these, farmers were frankly grateful. Inoculation of sheep with the blackleg vaccine was highly commended as an insurance against losses from blood poisoning; application of cobaltised superphosphate had been an undoubted success in cobalt-deficient areas, but it appeared also to be beneficial to pastures outside the recognised deficient areas; D.D.T. and "Gammexane" superphosphate were of great assistance in the control of grass-grub. Farmers owed a lot to plant breeders for the new Club Root Resistant rape. Unthriftiness of lambs in December and January when the ewes' milk failed and lambs were dependent on grass had produced a crop of theories. They included the assumption that continual liming and heavy stocking had built up excess fertility to a point where some considered that the taking of a crop of wheat might readjust the balance.

Advocacy of special-purpose pastures and the special grazing management they required for quick establishment and full utilisation of their nutritional qualities was met by spirited defence of existing pastures from which good production was being achieved. Local opinion on the use of cattle with sheep to control pasture growth was divided.

Some Convictions

Statistical records confirmed the visual evidence on farms visited that a high level of grassland farming has been achieved. Present management is well adapted to best utilisation of existing swards.

More use of the plough to establish pastures of better botanical composition with a wider spread of utilisation and a "shortening of the winter at both ends" could decrease the dependence on supplementary root crops and increase carrying capacity. The additional livestock units should be cattle rather than more sheep.

There is a great potential for increased production in the sowing to pasture of red tussock and reverted areas after ploughing, fallowing, liming, and taking of cruciferous crops.

Future Conferences

Membership of the Grassland Association is open to all those interested in grassland. With conferences held in each island in alternate years, a great opportunity is offered for the extension of grassland knowledge by the personal discussion of progress and problems affecting the principal factor on which the Dominion's agricultural production depends. Next year's conference is to be at New Plymouth and that in 1952 probably at Timaru. The third day's papers on original grassland research are of sufficiently wide interest to encourage the attendance of all pastoral farmers. Support of local farmers is essential to the full realisation of the aims of the association.

—*G.J.N.*

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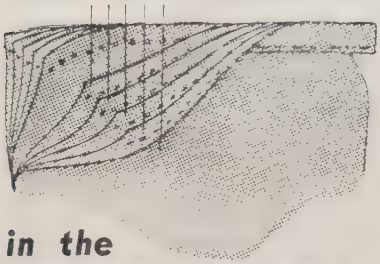

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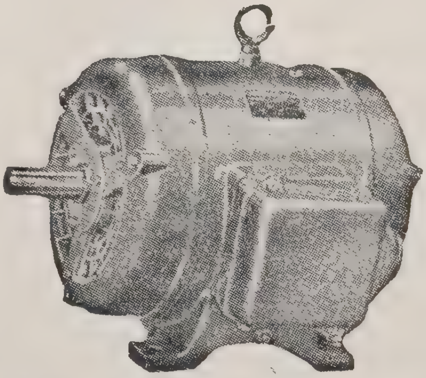

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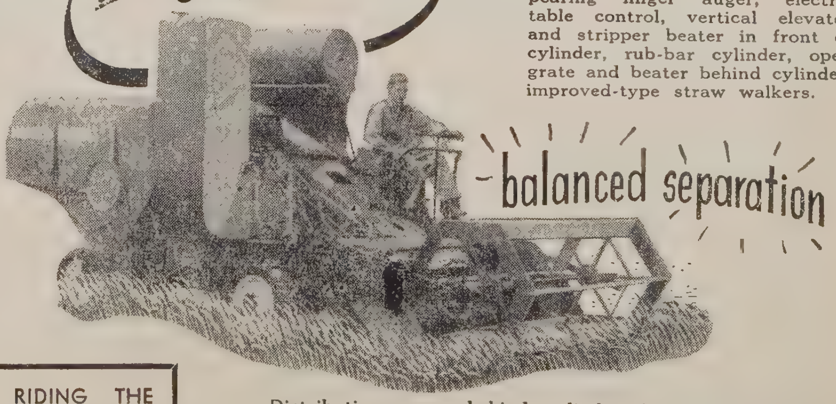

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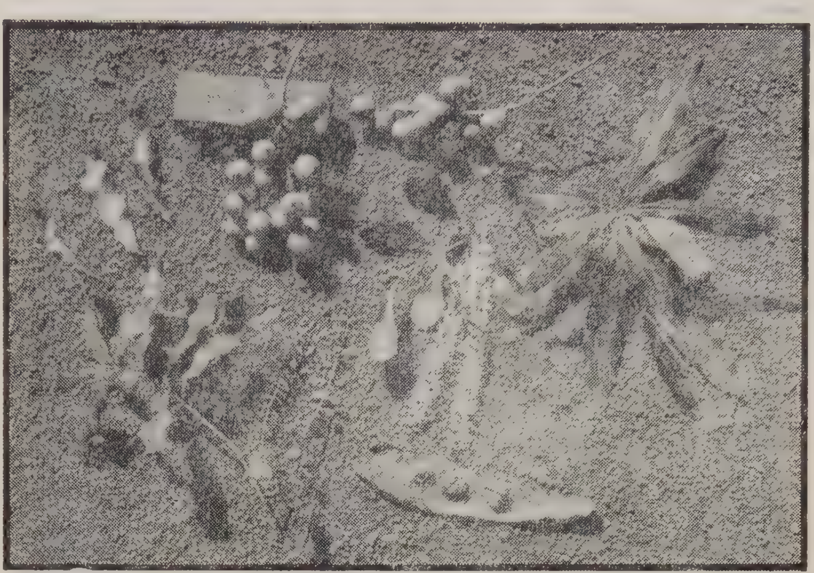
Queensland Nut Tree Culture in New Zeal

By P. EVERETT, Orchard
Instructor, Department of
Agriculture, Auckland.

THE Queensland nut tree, which is also known as Australian nut and Macadamia nut, is a native of the coastal regions of southern Queensland and northern New South Wales. It is evergreen and grows in a compact and symmetrical shape to make an attractive specimen tree. Its height at maturity varies from 30ft. to 60ft. according to strain, situation, and climatic and soil conditions. The beauty of the tree is enhanced by the many long inflorescences and the clusters of nuts produced. The nut kernel, which is of excellent dessert quality and is suitable for use in the production of high-grade confectionery, can be eaten fresh or roasted and lightly salted. A number of Queensland nut trees growing in Northland are producing good crops annually.



[*National Publicity Studios photo.*

Flowers, foliage, and fruit clusters of a Queensland nut tree growing at Kerikeri.

THERE are many strains of the Queensland nut, known botanically as *Macadamia ternifolia* F. Muell. All are evergreen, but a period of reduced growth occurs during the colder months. The growing shoots are readily injured by frost, as are the seedlings in their first and second years of growth. Older trees do not generally suffer any appreciable damage when subjected to several degrees of frost.

Culture in New Zealand

A few seedling trees are growing in several parts of the Auckland Province, but most are at Kerikeri in Bay of Islands County, where good crops of high-quality nuts have been produced for the past 5 years. Most of these trees began to crop when 10 to 12 years old. The leaves are mainly long and narrow and may be spiny or devoid of spines according to the strain.

The inflorescences, generally 6in. to 12in. long, appear mainly between August and October, but flowering may be spread over a considerable period.

Up to about 20 nuts may develop on a single raceme. Each is encased in a green husk or pericarp which splits open when the nut reaches maturity. In most strains the shell is smooth, round to slightly oval or pointed, and the average diameter is about ¾in. The shell is relatively thin but is extremely hard and in many cases cannot be cracked with an ordinary nutcracker. The nut kernel is rich in flavour, creamy-white, and possesses excellent keeping qualities.

Some strains of Macadamia produce nuts up to 1½in. in diameter with a rough exterior and a shell which is so thick and hard that it is not readily cracked even with a hammer. Seedlings from this type have recently been raised in New Zealand, but none has yet come into bearing.

As experience overseas indicates that trees are not readily grafted or raised from cuttings, propagation in New Zealand has so far been by raising young plants from seed. Cross-pollination occurs naturally, so that seedling trees do not always possess the same characteristics as their parents. The percentage of nuts that will germinate decreases with age, but about 70 per cent. can generally be secured from freshly harvested nuts. Before planting, the pericarps (but not the shells) should be removed and the nuts planted on their sides and covered with about 1½in. of friable soil. Young seedlings normally appear above ground 30 to 40 days from the time of planting, but in some cases germination may take up to 90 days. Best results can be expected by planting the nuts in September or October. Well-grown seedlings are a suitable size for planting out when 2 or 3 years old. For commercial plantings spacing of 22 to 28ft. on the square is recommended.

[*National Publicity Studios photo.*

Queensland nut tree 12 years from planting.

Diseases and Pests

No diseases have been recorded as attacking the Queensland nut in New Zealand and the only insect pest observed by the author to date is a species of thrip which causes silvery markings on the foliage and husks. The green vegetable bug (*Nezara viridula*) is a pest of the Queensland nut in Australia, where it sucks nutrient sap from the immature nuts, causing the fruit to drop while immature, and this insect may cause similar damage in New Zealand. Thrip and the green vegetable bug can be controlled by spraying infected trees with D.D.T., using 1lb. of a 50 per cent. wettable powder in each 100 gallons of water.

Until better-fruiting, more even types are available this ornamental and useful tree cannot be recommended for commercial planting in New Zealand. Seedling trees are considered eminently suitable in the warmer parts of the Auckland Province for planting in large private gardens, city parks and domains, and also as street trees, where overhead wires have not to be contended with.

Reference

"The Queensland Nut", by J. M. Wills, "Queensland Agricultural Journal", June and July, 1945.

PRIMARY PRODUCTION MONTHLY REVIEW

From data supplied by the Statistical Section, Extension Division, Department of Agriculture, Wellington.

LIVESTOCK SLAUGHTERED AT MEAT EXPORT WORKS AND ABATTOIRS

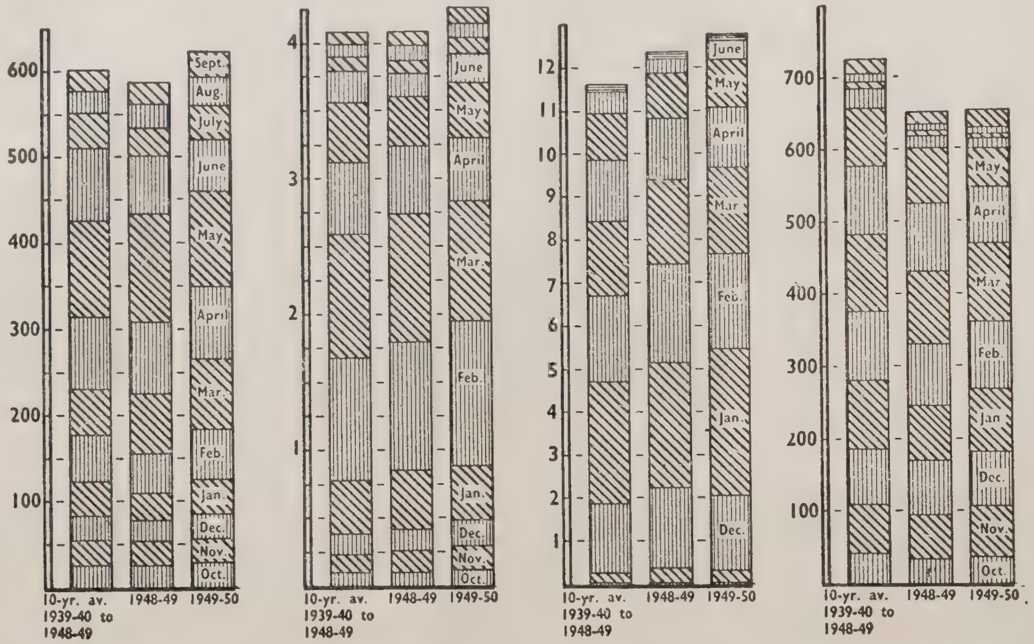
Season Oct. 1 to Sept. 30: Order of months October to September reading upward in each column

CATTLE Thousands of carcasses

SHEEP Millions of carcasses

LAMBS Millions of carcasses

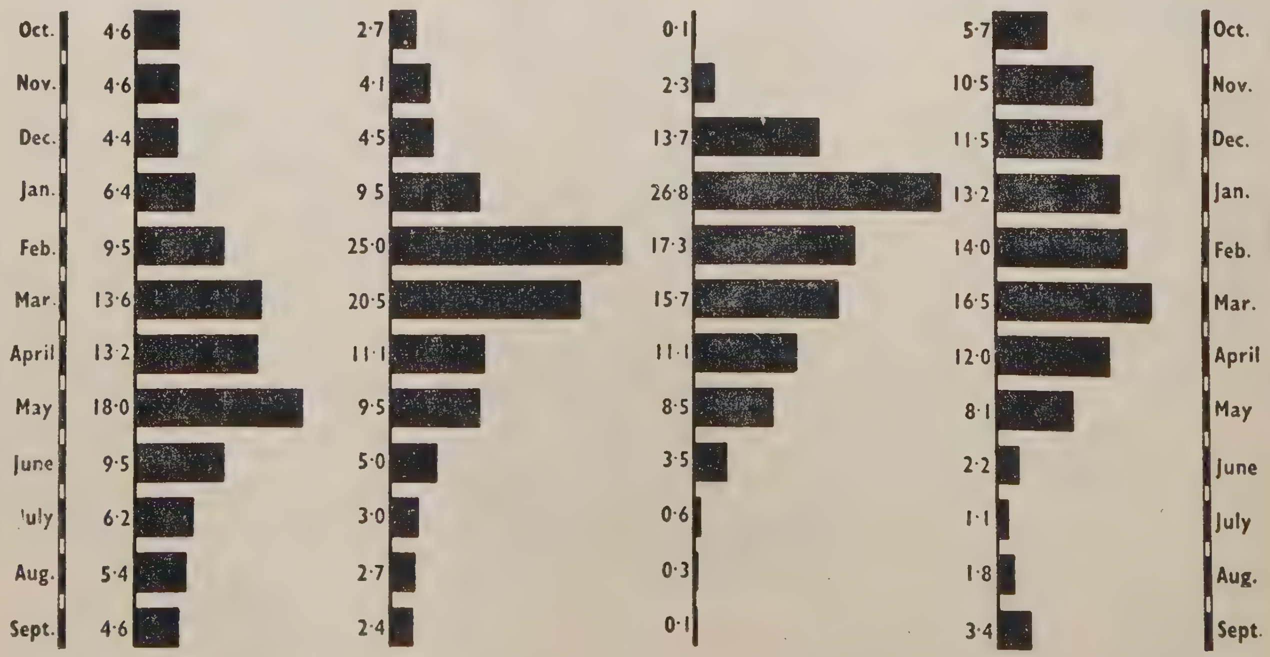
PIGS Thousands of carcasses



Monthly Distribution of Slaughterings at Meat Export Works and Abattoirs 1949-50

(Each month shown as a percentage of total kill)

CATTLE **SHEEP** **LAMBS** **PIGS**

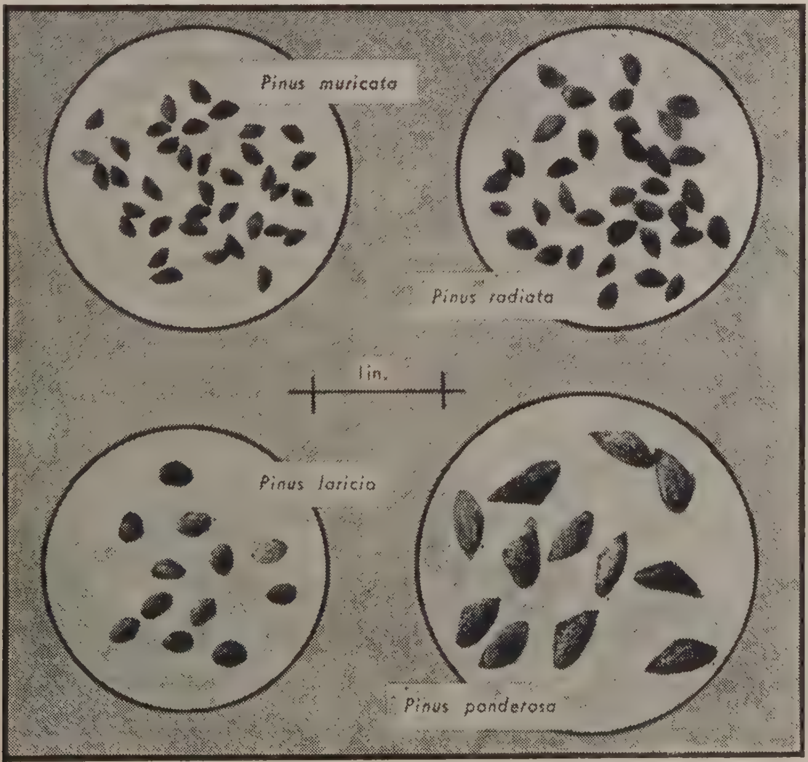


USES OF PINE TREES ON THE FARM

THROUGHOUT New Zealand many different kinds of trees have been planted for timber, for shelter, for beauty, and for protection against erosion, but for shelter purposes some species of evergreen, particularly of the cypress and pine families, are the most important. Characteristics of the better-known pines and the uses to which they may be put are the subject of this article by H. M. Steven, formerly Assistant Farm Forestry Officer, Department of Agriculture, Wellington.

Pinus radiata being cut up for firewood.

PINES are used widely for shelter in all districts of New Zealand, but few of these belts are entirely satisfactory. No doubt the ease with which the trees transplant and the rapidity with which they grow are the main factors for their wide popularity, for in 4 to 7 years after being planted the insignis pine (*Pinus radiata*) provides a very effective windbreak and shelter for the farm. Unfortunately, this efficacy is short lived. Before they are very old (from 15 years onward) they tend to become open at the base and draughty because of the loss of their lower limbs, so that, though they still act as a break to the wind, they cause chills to stock which endeavour to shelter under them. To some extent this opening up can be delayed by allowing the trees room to spread their lower branches and by leaving ample room between the trees and the fence to prevent stock reaching and damaging the trees. Pines in a mixed belt can also contribute to efficient shelter.



Seeds of some of the more common species of pines.

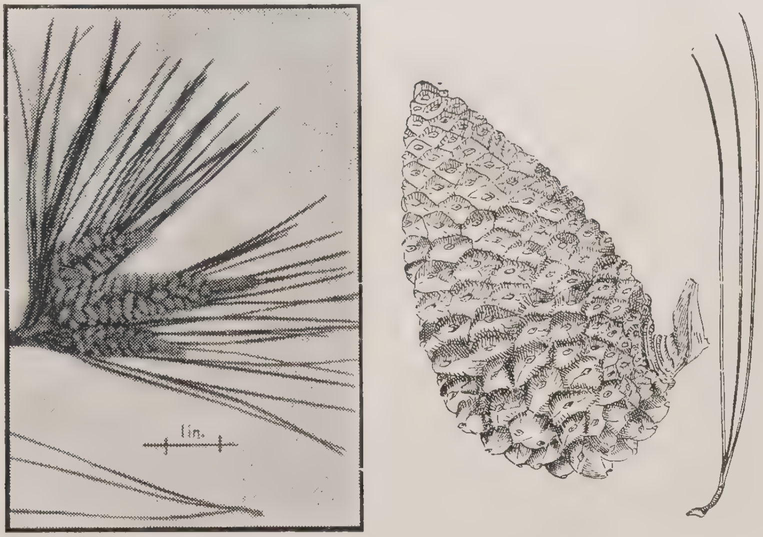
Characteristics of Pines

Pines belong to the class *Coniferales*, which includes families of cypresses, firs, and spruces, all trees in which the seed is borne in cones. The character and appearance of the cones differ widely and provide a good means of distinguishing species. The branches of pines grow in regular circlets on the trunk and extend sideways, especially in young trees; in old trees the pyramidal habit is lost and the trees become flat topped with spreading crowns. The leaves are needle-like and borne in clusters of two, three, or five.

The terminal winter buds vary between species in colour, shape, and the character of the scales, which may be resinous or non-resinous, tightly pressed to the bud or free at the top, and with or without their tips curved back (reflexed). Male and female flowers occur on the same tree in spring or early summer. The small, male cones, borne in clusters, are usually yellowish but may be red or orange. The female cones, insignificant at first, are carried in clusters of two to four near the growing tips. They are composed of a number of spirally arranged green scales or bracts which open in the first year to receive the wind-borne pollen and close again afterward. They then increase in size and take two or more growing seasons to mature, by which time the cone scales are brown and thickened and often have protuberances, which may be sharp and prickly as in the prickly-cone or Bishop's pine (*Pinus muricata*). The seeds are carried on papery scales within the cone, and when the cone scale opens the seeds escape attached to a well-developed wing which aids in their dispersal by the wind.

PINUS RADIATA ON THE FARM

Pinus radiata (insignis pine)



GENERAL APPEARANCE: Heavy crowned; pyramidal when young but loses its lower branches early; foliage thick and lightish green. MATURE HEIGHT: 100 to 160ft. BARK: Dark grey-brown with deep longitudinal ridges. NEEDLES: In groups of three, dense and crowded on the twig; 4 to 6in. long, sharply pointed and slender. MATURE CONES: Greyish brown with short stalks; oblique shape with outer sides longer than inner; 3 to 6in. long, $2\frac{1}{2}$ to 3in. in diameter; persist on the tree for several years. SEEDS: Blackish, oval to triangular, and rough; $\frac{1}{4}$in. long with a light brown wing 1in. long.

There are 80 to 90 species of pine, some of which have been grown in New Zealand with varying degrees of success. By far the most common is the insignis pine (*Pinus radiata*), with the prickly-cone pine (*P. muricata*) and maritime pine (*P. pinaster*) next in favouritism. The western yellow pine (*P. ponderosa*), the Corsican pine (*P. laricio*), and *P. murrayana* have been planted to a less degree.

Distribution of *P. radiata*

A native of California, *Pinus radiata* has a very limited distribution there and grows only in a small area of hilly ground near the sea. The largest natural forest is on the Monterey Peninsula, where the climate is characterised by winter rainfall (the average is less than 20in. yearly) and summer fogs, with temperatures ranging between 30 and 90 degrees F. In its native country it is not an important tree, partly because of its sparse occurrence but chiefly because of the abundance of higher-quality timber trees such as Oregon pine and western yellow pine.

In South Africa, Australia, and particularly in New Zealand large numbers have been planted since it has been found capable of adapting itself to a wide range of conditions of both climate and soil. It grows satisfactorily in all but the poorest of soils (though it is intolerant of a badly drained subsoil) and from sea level (though there are hardier coastal pines) to several thousand feet above, but in the high altitudes where trees are subject to low temperatures and severe frosts *P. radiata* may be attacked by a fungus (*Phomopsis*) which gains access through frost-damaged tender tips.

The best conditions for the tree in New Zealand seem to be an annual rainfall of about 60in., summers neither too hot nor too dry, and a well-drained loam or clay-loam soil.

P. radiata is a tall tree, reaching up to 160ft. at maturity, 80 to 100ft. being an average height, and is often heavily branched, though when young it is regular and pyramidal in outline. In the mass the foliage appears a rather dark green. The slender needles are 4 to 6in. long, usually in groups of three, and dense and crowded on the twig. Ripening cones are carried singly or in groups of three to five on short stalks and are from 3 to 6in. long.

P. radiata in Shelter Belts

In general, planting single-row belts of *Pinus radiata* is inadvisable, for even if wide fencing leaves them sufficient room to develop their lower branches out of reach of grazing stock, these branches will die off in time, to the detriment of the whole belt. Double-row belts are an improvement, but five or six rows or a plantation block form the most satisfactory windbreak, especially on the poorer land where the extra feet necessary for the wider belt can be spared

A combination of *P. radiata* with a hedge provides permanent low shelter. To form a good windbreak the hedge may be planted at the same time as the pines so that the hedge becomes well established before the pines open up, thus forming an impenetrable barrier. Provided ample space is allowed so that the hedge is not overcrowded, any species suitable for local conditions may be used with the pines; barberry, boxthorn, gorse (if trimmed), *Hakea saligna*, and *Eleagnus* are satisfactory, and in severe climates pampas grass and flax will shelter the pines at first.

P. radiata is better not planted in a mixture with other trees, as little else can compete with pines for rate of growth and they are likely to smother anything planted near them, but if care is taken they can be used as a marginal band. *P. radiata* can be used as protection for one of the cypresses or in combination with other pines. Better results are achieved in exposed coastal areas by planting the *P. radiata* on the inside of the hardier *P. pinaster* or *P. muricata*.

The species most used for combining with pines are either *Cupressus benthami* (Bentham's cypress) or *Cupressus macrocarpa* and, in some circumstances, *Chamaecyparis lawsoniana* (Lawson's cypress); for instance in coastal areas where wind and salt spray make conditions too severe for the Lawson's cypress unless it is given some first shelter. Pines with macrocarpa or Bentham's cypress may be used as a two-row belt or they may be planted with several rows of one or both species.

Pinus radiata planted as first shelter for Lawson's cypress. They are beginning to crowd out the cypresses and should be removed.

A trimmed hedge of *Pinus radiata* planted 4ft. apart and topped each year to 8ft.

Sometimes pines are planted with another species solely for their value in giving temporary shelter which enables slower-growing, longer-living trees to become well established. In such cases, as the pines will be cut out, they may be planted on the exposed side of the belt 15ft. from the "permanent" trees, and with 6 to 8ft. between the trees they will make thick shelter rapidly. Space must be left for the roots of the "permanent" trees to develop evenly on all sides; otherwise when exposed to the full force of the wind by the removal of the pines they may be thrown in a strong gale.

In a shelter belt which is to remain until each species comes to maturity up to 20ft. should be left between the rows and 10 to 12ft. between the pines. Too often one row in a belt is dominated by more vigorous-growing trees, which usually are pines. If the belt is left untouched, the pines probably will suppress the "permanent" trees completely. A light cutting back of the too-powerful limbs may help, but for the sake of the more desirable trees the pines are better removed altogether.

Pinus radiata is not often mixed satisfactorily with broadleaf trees except in a driveway shelter belt or in plantation planting. In order not to be smothered broadleaf trees, such as oaks and poplars, must be left plenty of room and full access to light. Sometimes that means later thinning out of the pines, or the deciduous tree may be planted along the outside margin. These trees are very valuable in building up the soil fertility with their leaf mould.

Eucalypts with *P. radiata* provide variety and both are quick growing, but, as they have few branches low down, they should be used in conjunction with a hedge.

P. radiata as a Trimmed Hedge

In practice, time and labour problems are usually against the use of *P. radiata* as a hedge, but when it is kept trimmed a shelter green and windproof to the ground may be obtained, as the cutting back of the higher branches prevents those below being overshadowed. Pines, like most conifers, cannot send out new growth from old wood, so that to form a hedge trimming must be started early and kept up regularly. At no stage will they stand severe cutting. When later utilisation for timber is not a consideration, many farmers top pine trees without trimming the sides in the hope that they will shoot out and fill up at the bottom. The topping is often not started until the tree is 10 to 15 years old and, as in side trimming, hard cutting back at this stage is likely to kill them.

Many belts have become ugly through being slashed back without mercy because of their proximity to power and telephone lines. A farmer who wishes to plant shelter near wires—for example, along a road or boundary fence—would be well advised to plant only a hedge.

Renovation of Open Belts

A high shelter belt which is still vigorous and healthy but has lost its efficiency by becoming open at the base may be made effective again by planting a hedge along it 4 to 6ft. from the old trees. Usually the hedge should be put on the sunny side, as it will grow more rapidly there. However, if space is at a premium, a hedge may be planted closer on the exposed side of the pines, as the growth of the trees will tend to be less there than on the margin away from the wind. A newly planted hedge needs some protection from stock, and that may mean a new fence if the original one has fallen into disrepair, as a hedge species which is stock proof when grown is likely to be nibbled at or uprooted while its growth is young and tender.

Pinus radiata with eucalypts provides good high shelter, but this belt needs a hedge to prevent draughts.

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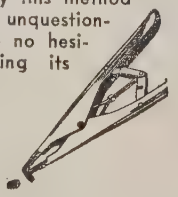

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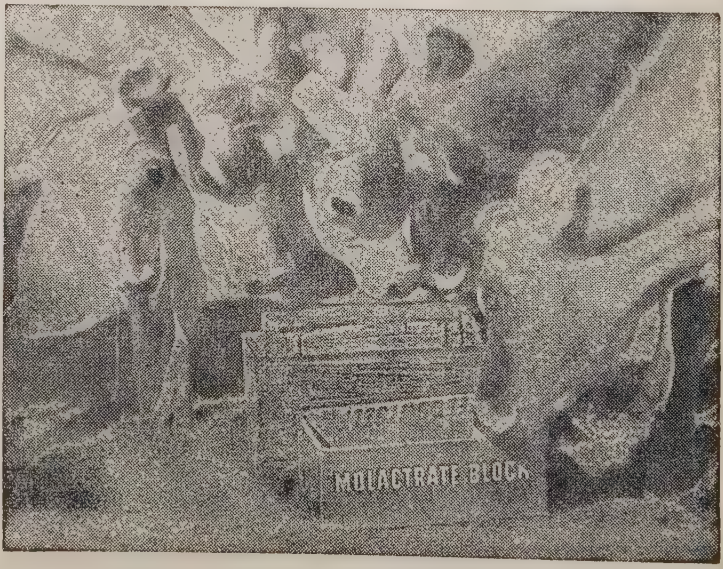
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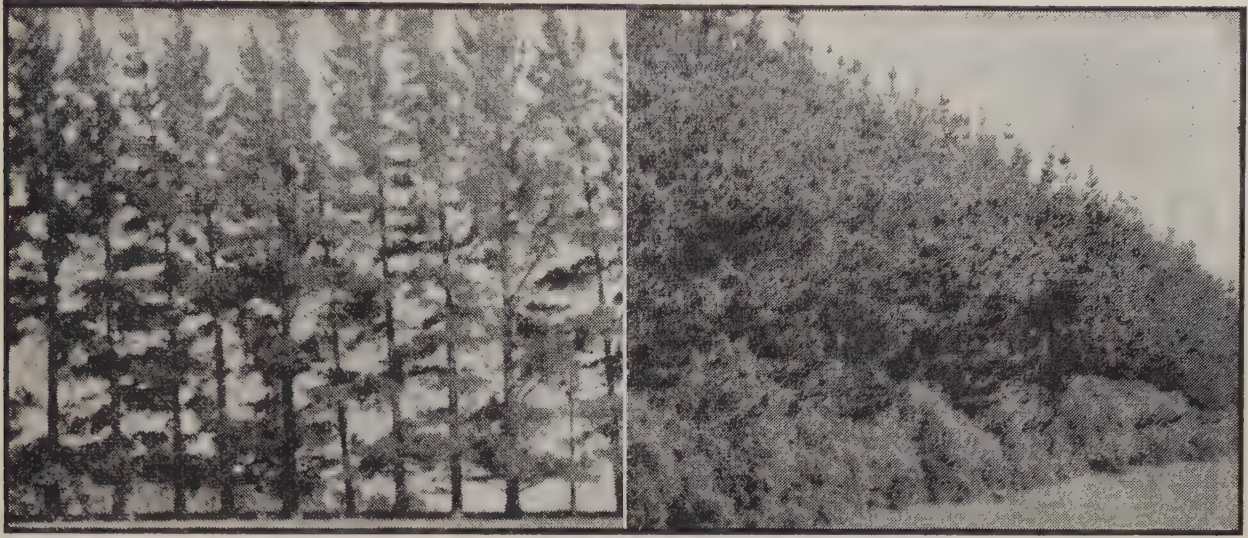

Left—A tall single-row windbreak of *Pinus radiata* which is open and draughty at the base. Right—Boxthorn filling up below an old, open *P. radiata* belt.

One of the most widely useful species for underplanting pines is *Eleagnus*, which grows vigorously under favourable conditions and will stand wide variations of soil and climate, succeeding on poor or wet soils or against salt winds. The plants can be spaced 3 or 4ft. apart and 4 to 6ft. from the pine trunks. *Eleagnus* will tolerate considerable shade, so that sometimes it may be planted between a double row of pines. If *Eleagnus* is planted close to old trees, it tends to be drawn upward into their crowns.

In selected situations boxthorn can be used as low shelter with pines, but it will not stand the same amount of shade as *Eleagnus*, so it is best planted at the same time as the pines and on the sunny side of them.

The native karo (*Pittosporum crassifolium*) will thrive in heavy shade and will stand strong salt winds and much drier soil conditions than boxthorn, but it requires permanent double fencing as protection from stock.

P. radiata in Plantations

Pinus radiata planted in blocks or plantations is useful when required for timber production, to suppress weeds, to utilise rough, otherwise waste country, to control erosion, or for any combination of these reasons.

Rarely does a farmer with a limited acreage plant *P. radiata* for timber production on his good land, but frequently such places as gullies and inaccessible corners can be put to good use by being planted in trees. If pines are used, they should be planted 8ft. apart each way to encourage tall, straight growth; when necessary they can be thinned. In such blocks some deciduous broadleaf species can be included; for example, sycamore may be scattered among the plantation trees, or a border of oak, ash, or poplars planted surrounding the pines. As well as improving the appearance of the plantation, the deciduous trees provide valuable humus material for the soil.

These *Pinus radiata* were too near power lines and had to be cut back so hard that they died.

For planting in weedy country *P. radiata* is particularly valuable, as its quick growth and dense branching enable it to suppress the growth and spread of such weeds as blackberry and gorse. In gorse it is advisable to clear lines and plant the trees in straight rows, as trees which have failed and need replacing can then be seen readily. Unless blackberry is very dense, *P. radiata* may be planted directly in the area, or lines may be cut. The pines are best planted only 6ft. apart, and this will result in heavy shade in a short time. For use in gorse or blackberry 2-year trees up to 2ft. high are satisfactory, for the bigger tree has a start against weed growth and will thrive as long as the tips are kept clear. After 2 or 3 years the trees will be well established, in 4 to 5 years they are likely to be as high as the gorse (depending on such factors as the soil and the initial height of the gorse), and in about 10 years there will probably be little sign of the gorse.

To control erosion *P. radiata* can be planted in gullies, on facings too steep or rough for cultivation, and on sand dunes, where the trees will help to stabilise the area and encourage other plants to come in.

P. radiata as Homestead Shelter

Around homesteads in New Zealand *Pinus radiata* has been used more than any other species because of the speed with which it gives shelter. A widely occurring mistake is leaving insufficient space for the full growth of the pines, and all too often the trees are planted too close to the house. Two chains should be left between the house and the nearest pine; that may seem unnecessarily far when planting an 18in. seedling, but the height to which the tree will grow in 35 to 40 years must be considered. If they are planted much closer than this, tall tree may be blown on to the house and the sun will be excluded, the house being shut in and the view shut out.

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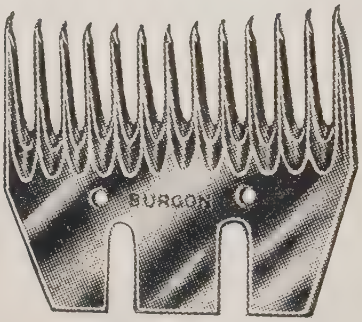

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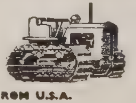

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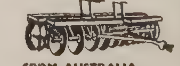

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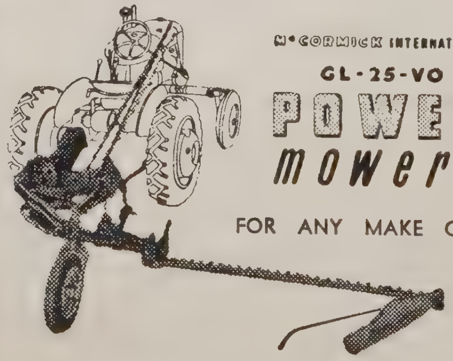

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Pine trees planted too close to a house are dangerous.

In shelter driveways *P. radiata* can provide the first shelter while more lasting trees and more attractive shrubs become established. The surroundings of the home can be improved greatly in appearance by judicious planting—pines in the background, some other conifer such as *Cryptomeria* or Lawson's cypress in front of the pines, and then deciduous trees and coloured shrubs as a low belt in front again.

Propagating *P. radiata*

Pinus radiata can be obtained from nurserymen as wrenched seedlings or as transplants, or the farmer may grow his own planting stock. Collecting cones of *P. radiata* is not difficult, but only shiny brown, well-shaped cones from straight, healthy trees should be used. Artificial heat or hot sunshine will open the cones and free the seeds, which may be sown the following spring. They should be planted in a shallow drill and covered only lightly, and they may need protection from birds. Because of their very high germination they need be sown only thinly.

The seedlings grow quickly and may be planted out after a year. To form a good root system which enables easy transplanting the trees should be wrenched well before being lifted. They can then be lined out for another year in a nursery or they can be put straight into their permanent positions. In some districts where winds are very strong sowing the seed directly where the shelter belt is wanted and thinning the surplus may result in trees with a firmer hold and much less damage by wind than if transplants were used.

Pinus muricata

Being more restricted in their range, the other species of pine have been planted less widely than *P. radiata* and under more special conditions. Of these secondary species *Pinus muricata* (the prickly-cone pine) is the most important. It is a darker and more bluish green than *P. radiata* and easily distinguished from it by its more compact, bushy habit and its smaller, prickly cone. The needles are in pairs which are crowded densely on the twig. Rarely does the tree attain any great size in New Zealand; usually it grows to about 40ft. high with a diameter of 12 to 18in.

It is a native of California and grows there on rocky headlands in coastal areas, but it is not present in large enough quantities to be of more than local significance. Throughout New Zealand it is growing under a variety of conditions, as it is very hardy and not very sensitive to soil variations. It thrives on poor or good soils, dry or damp, and also on sand, but its greatest value lies in its ability to stand salt winds and a great deal of exposure.

[Green and Hahn Ltd. photo.

Pine trees planted in lines to kill out gorse.

Though it grows only about two-thirds as quickly as *P. radiata*, it is nevertheless one of the best pines for shelter, as it tends to branch horizontally, thus allowing plenty of light to reach the bottom branches and preventing the tree opening up so soon. However, if it is not protected by good fences, damage by grazing stock will result in loss of its efficiency as a windbreak.

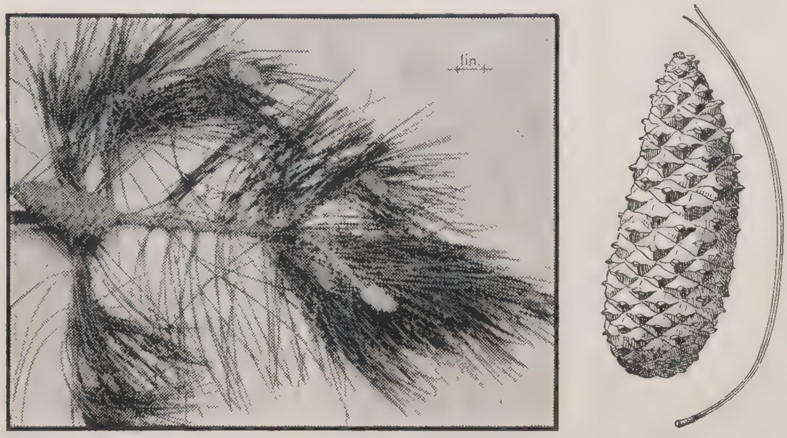
Either single or multiple belts may be grown, the latter being more satisfactory for shelter. In a mixed belt, *P. muricata* has one advantage over *P. radiata*: Being of slower growth, it is less likely to dominate other species. Provided trimming is light, a complete green surface may be maintained from the ground upward, forming a solid barrier against wind or fire. This species is not topped as commonly as *P. radiata*, as it is less susceptible to wind damage because of its more compact habit and smaller height.

For planting in waste areas *P. muricata* is not very suitable, as it is not likely to grow quickly enough to smother weeds and its timber is not of first quality. Undoubtedly its greatest value is for planting on coastal farms as the first line of shelter where the exposure is too much for *P. radiata*.

Pinus pinaster

Originally planted in many localities in New Zealand, *Pinus pinaster* (the maritime pine) may often be distinguished easily by its curved stem, bare for much of its length, with sparse branches at the top forming a rounded crown. *P. pinaster* is a native of the Mediterranean region, extending into Greece and Algeria, where some trees reach 90 to 120ft.

Pinus pinaster (maritime pine)



[*Photo News Ltd. photo.*

GENERAL APPEARANCE: Wide crowned; bushy and branched when young, but soon loses its lower branches and develops a bare, often leaning, trunk with spreading branches at the top; foliage dark grey-green and heavy. MATURE HEIGHT: Up to 120ft., but usually not above 60ft. in New Zealand. BARK: Reddish grey; smooth plates with wide, dark furrows. NEEDLES: In pairs; 5 to 6in. long, stout and often curved. MATURE CONES: Mahogany coloured and shiny; no stalks or prickles; sometimes remain closed for several years; 3 to 7in. long, 1½ to 2½in. in diameter. SEEDS: Shiny brown and smooth; 1/3in. long with a wing 1 to 1½in. long.

with a diameter of 2 to 4ft. at breast height, but usually in New Zealand the trees do not exceed 60ft. in height with a diameter growth of 3 to 4ft.

The needles are in pairs, 5 to 6in. long, stout and coarse, and grey-green in colour. The cones are 3 to 7in. long and only 1½ to 2in. in diameter at the base, shining brown, and often produced singly on the stem. Though in the early days it was planted extensively in New Zealand, especially on coastal farms, its place for this purpose is now being taken largely by *P. muricata*. It requires a well-drained and rather light soil, so it is surprising that it is being grown, apparently successfully, in Northland on heavy clay soils where *P. radiata* will not grow.

The maritime pine is suitable for planting on sand dunes, as it is essentially a low-level tree, and as well as being hardy it seeds prolifically, so that there is much natural reseeding and regeneration—an advantage in sand-dune reclamation. In France, Portugal, and England many acres of sand-dune country have been reclaimed with this pine. In south-west France many men are employed extracting and processing the resin and turpentine yielded by *P. pinaster*.

In New Zealand its use for shelter is confined to coastal situations where it can provide the first shelter for some other species planted to leeward of it. Because of its habit of losing its lower limbs early in life a hedge such as *Eleagnus* is often worth planting under it.

Pinus ponderosa

Because of its regular pyramidal shape *Pinus ponderosa* (the western yellow pine), especially when young, is a striking tree and retains its lower branches well. It has heavy foliage of a bluer green than that of *P. radiata* and this is carried in tufts, especially at the ends of the twigs. The needles are in clusters of three, 5 to 10in. long and stout, and are retained on the stem for about 3 years.

P. ponderosa is a common tree in western North America and produces more timber than any other pine. In its homeland it is widely distributed, growing from sea level up to 6000 to 8000ft. above, but in New Zealand it has been planted in comparatively small numbers, in the Rotorua forests, in plantations on the Canterbury Plains, and in Southland and Otago.

Compared with *P. radiata* it grows slowly, taking two to three times as long to reach the same height, but it is capable of withstanding greater extremes of cold, especially the frosty cold of high altitudes. *P. ponderosa* is not particular in its soil and climatic requirements, and if drainage is good it will thrive on moist or dry soils, and even on almost bare rock, and therefore is useful for planting on poor, dry areas.

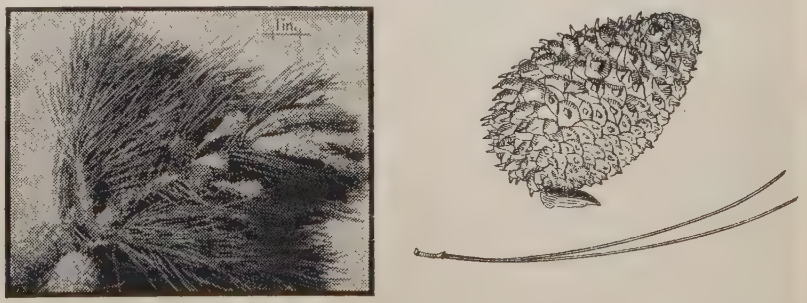
When young it forms a dense wind barrier, as it retains its lower branches better than most pines, but because of its slower rate of growth and its open form when old there is little advantage in planting it for shelter except in mixed belts. *P. ponderosa* is an attractive tree planted as a single specimen or in a mixed driveway.

Pinus laricio

As its common name of Corsican pine suggests, *Pinus laricio* has its native habitat in the island of Corsica, but it is widely distributed in south and central Europe and in Asia Minor and occurs in many geographical forms. In New Zealand it is grown in plantations at high altitudes in both North and South Islands, and it is a useful tree for timber production on the better-drained soils. It forms a tree 70 to 80ft. high with a clean trunk and light, narrow crown made up of distinct circlets of horizontal side branches. The foliage is a greyish green and the needles, carried in pairs, are 3 to 5in. long, often very curled and twisted and having sharp points.

As in Europe, this tree takes 70 to 80 years to reach maturity and should be planted in this country only for production of long-rotation timber, as in most places where *P. radiata* flourishes it requires only half as long as *P. laricio* to produce millable timber. *P. laricio* is very hardy and planting

Pinus muricata (prickly-cone pine)



GENERAL APPEARANCE: Bushy with a compact head; branches horizontal or drooping, and in some conditions retained to the ground; foliage bluish green and dense. MATURE HEIGHT: 50 to 80ft. BARK: Reddish brown with scaly ridges; not quite as coarse as that of *P. radiata*. NEEDLES: In pairs, crowded together closely; 3 to 5in. long, stiff, but not as sharply pointed as those of *P. radiata*. MATURE CONES: Grey with short stalks; oblique but not symmetrical, with sharp prickles on the scales; 2 to 3in. long, 1½ to 2½in. in diameter; persist on the tree. SEEDS: Dark brown; smaller and with a smoother surface than those of *P. radiata*; ¼in. long with a wing ¾ to 1in. long.

it is warranted in districts where the climate is too severe for *P. radiata.*

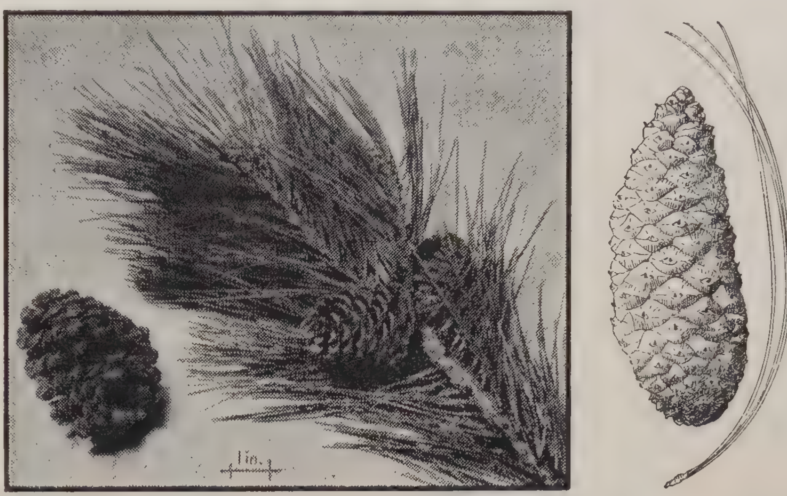
A closely allied and commonly grown tree is *Pinus austriaca* (the Austrian pine), which is a slower-growing and inferior tree suitable only for very high, very cold positions.

Use of Pine Timbers

Pines grown in shelter belts of only a few rows rarely produce good timber, because the side branches have been allowed to develop fully, resulting in knotty timber which is difficult to handle. Nor do pines supply first-class firewood, as the wood is light and burns away very quickly without producing much heat, but the cones are good fuel. As fencing posts or battens pine timber is not durable and lasts only 3 to 4 years, but in the absence of more suitable trees pines may be put to temporary use and their life lengthened with a preservative. Creosote gives the best results and, though its use is rather costly on pines, it will extend the life of a post to between 10 and 20 years.

Well-grown *Pinus radiata* trees, preferably from block planting, can provide sawn timber useful to the farmer. Timber from fully matured trees aged 35 years and more is useful for indoor construction work and, as it is not inclined to warp, for forms for concrete work and for box making, because it holds nails well and does not split readily. Even young trees produced in large economic units are valuable for pulping.

Pinus ponderosa (western yellow pine)



GENERAL APPEARANCE: Pyramidal, with regular branching which is retained well; heavy, blue-green foliage at the ends of branches. MATURE HEIGHT: Usually 60ft., sometimes up to 100ft. BARK: Yellowish or dark red-brown, breaking into irregular plates. NEEDLES: In groups of three, spreading apart; 5 to 10in. long and stout. MATURE CONES: Light reddish brown with very short stalks or none; ovoid; minute sharp prickles on apexes of scales; 3 to 8in. long, 2½ to 4½in. in diameter. SEEDS: Fawn, smooth, and oval; ¼ to 1/3in. long with a wing ¾in. long.

The other species of pine grown in New Zealand are not of such value for their timber, as most of them are not in sufficient numbers to be of importance. *Pinus muricata* rarely reaches millable size and therefore is not important as a timber producer, but when it is sawn the timber is of moderate quality, light and coarse. It can be used for firewood or, if treated with creosote, for posts.

Pinus pinaster as it grows in New Zealand so often has a curved stem that usually it is ignored for timber use. It has a resinous, rather coarse, strong timber. Its main use is in the round for pit props or sawn for rough carpentry. Like the other species, it must be creosoted to give it any durability in contact with the ground. It makes fair fuel.

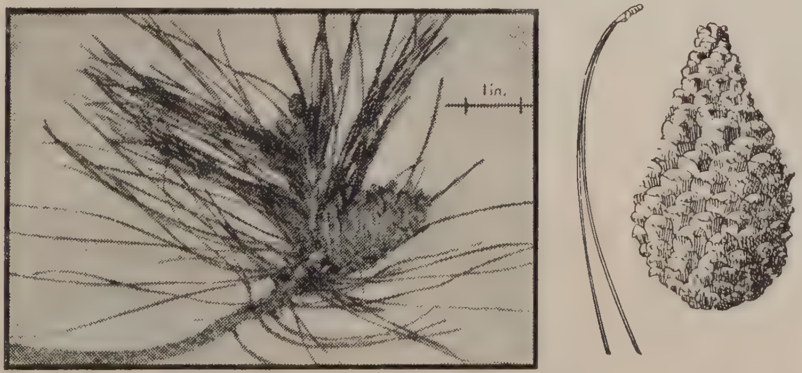
Pinus ponderosa is widely distributed in immense forests in western North America and is one of the great timber trees, but its slow growth and slow maturing (80 to 100 years) make planting it in New Zealand of doubtful value. In its native habitat it grows up to 250ft. high with a diameter of 12ft., but trees being milled there are several hundred years old. The timber is hard and strong and is used for indoor finishings of houses or for furniture, railway sleepers, and general heavy construction work, but it is not suitable where durability in contact with the ground is required unless it is seasoned well and treated with a preservative.

Timber of *Pinus laricio* is fairly strong, but is durable only if the trees are properly matured, and that takes 80 to 100 years. The timber is light and soft when young and even in trees 100 years old the proportion of heart wood is small. In general, it is not an important timber tree, though in the Mediterranean region some of the many varieties of this and closely allied species are used for building.

Other Species Used

In this article five of the most commonly planted pines have been considered, but in recent years other species have been tried, such as *Pinus palustris* (long-leaf pine), *P. taeda* (loblolly pine), *P. echinata* (short-leaf pine), and *P. caribaea* (Cuban pine). *P. murrayana,* closely allied to *P. radiata,* is also proving a valuable tree for high inland areas; it does not grow as tall as *P. radiata* and its cones are much smaller. *P. sylvestris* (Scots pine or Scotch fir) was planted in the early days, especially in the South Island, but only isolated groups remain.

Pinus laricio (Corsican pine)



[*Photo News Ltd. photo.*

GENERAL APPEARANCE: Open, rather narrow crown; foliage dark bluish green and sparse. MATURE HEIGHT: 70 to 80ft. BARK: Greyish to dark brown with wide vertical cracks. NEEDLES: In pairs; 4 to 6in. long; slender and soft, curved or even twisted. MATURE CONES: Rather tawny yellow, becoming brown; smooth scales; 2 to 3in. long, 1 to 1¼in. in diameter.

Seed Harvest and Crop Production

SEASONAL NOTES Contributed by the EXTENSION DIVISION

SUMMER work covers not only the harvesting of hay, silage, cereals, and grass and clover seed crops, but preparatory work for autumn sowings. Growers of Certified grass and clover seeds should co-operate with Extension Division officers in the work of paddock branding and sealing. When a sack is being sewn the knot should be placed inside and buried in the folds of the sack. This enables the sack to be sealed with only one seal. Binder twine should not be used.

* * *

STACKING OF SACKS

Sacks for sealing and branding should be stacked so that the mouth and last-sewn lug of every sack are readily accessible, or the whole stack may have to be pulled down to seal the sacks. Care in stacking saves sealing officers time and obviates rebuilding which may not be to the satisfaction of the farmer.

* * *

THRESHING CLOVER

Considerable care is needed to reduce to a minimum losses associated with threshing of clover seed. On the one hand much seed can be lost through incomplete threshing; on the other, damage to seed threshed can reduce the value of the line appreciably. Officers of the Extension Division have been investigating this matter in the last two seasons and it now seems that the most important factor in reducing loss from either cause is to ensure that the crop is in proper condition before attempting to thresh it.

* * *

CONDITION OF SWATH

Most clover seed is threshed out of the swath with a header and attention to the condition of the swath both when cutting and when threshing pays. The swath should be of even density along its length and, if necessary, it should be pulled in with two divider boards so that it can be picked up easily, but it should not be so thick that drying out is impaired. At threshing time the swath should be dry from top to bottom. If rain has fallen on the swath, it will be advisable to lift the swath with an aerator so that it is brought up on the top of the stubble, where it dries out rapidly. It has been possible to head a crop 4 hours after the use of the aerator, whereas if the swath had been left to dry out normally, there would have been 2 or 3 days' delay. At no time should a swath that is dry on top and damp below be threshed, as with these conditions prevailing it is impossible to thresh efficiently and damaged seed will result. If the crop is not in a condition for good threshing, either seed will be lost through incomplete threshing or seed will be broken in an attempt to thresh cleanly by closing up the machine and increasing the drum speed.

* * *

SETTING OF HEADER

Seed can easily be damaged by the header when not in condition, but if it is fit for threshing, little damage should result if normal settings are used. The header should be run with the lowest drum speed and the widest concave setting which will give clean threshing. It is better to lose a little seed than to thresh harder and cause breaking, cracking, and chipping, but if a satisfactory job cannot be performed, it is better to postpone threshing. If seed is being broken, damage is easily seen, but cracked and chipped seeds are harder to observe and a magnifying glass will prove handy to the man who wants to get the best result. Having the header travelling at a uniform speed and taking up swath which is as even as possible will also contribute to good threshing.

ROGUEING POTATOES

The object of seed-potato certification is to maintain stocks pure, healthy, and true to name; the grower who desires to produce good, healthy lines of seed, whether Certified or uncertified, for the trade, is faced with the task of maintaining this standard. The chief method of attaining and maintaining this objective is by rogueing, which is best described as the removal of all undesirable plants from the crop. To be effective the operation should be carried out at different stages of crop growth, as undesirable plants, whether foreign varieties, plants carrying disease, or weak plants, are more easily detected at certain growth periods. In all cases the undesirable plants should be dug out and the tubers removed.

* * *

FOREIGN VARIETIES

When tubers are sprouted before planting, foreign varieties can be detected, in many instances, by the colour of the sprouts. The best period at which to detect foreign varieties, however, is at flowering time, when the plants have reached their full stage of growth. Flower colour or even the absence of flowers is often the means of detecting a rogue. It is essential when rogueing for foreign varieties that the grower should have in his mind a picture of the growth habit and general appearance of the variety he is growing. He should then remove all those plants that do not conform to all characteristics of the variety concerned. To maintain purity the final rogueing should be done when the crop is mature, as "bolters" (late-maturing plants) are then easy to distinguish.

* * *

DISEASE

Cropping power is limited by a group of diseases known as virus diseases, which are carried over in the tubers from year to year and are mainly transmitted from diseased plant to healthy plant by sucking insects such as aphides. It is only in the growing plant that these diseases can be detected. It is not necessary to be able to distinguish one virus from another in order to remove diseased plants, but the grower should rogue from his crop any plants that look weak, are obviously stunted, or are apparently diseased. To avoid early transference of disease, rogueing should begin within 6 to 8 weeks of planting. At this time healthy plants have not yet developed the heavy tops that later would tend to hide the smaller, diseased plants and there is a minimum of transmission of disease to healthy plants. Early rogueing should be followed by periodical inspections to eliminate diseased plants that may appear later.

* * *

TIME OF INSPECTION

For rogueing the crop dull, calm days are the most suitable. Bright, sunny days tend to mask the leaf mottling which is characteristic of mosaic virus, and the shadows cast by the upper leaves are confusing. When rogueing is done on a sunny day inspection will be easier if the grower works one way, with his back to the sun. Rogueing is worth while only when lines are reasonably free from disease. Lines which are heavily infected should be discarded and a line of Certified seed brought in.

* * *

HILL SELECTION

An alternative procedure to crop rogueing is to select during the growing season healthy typical plants which are separated from weak and unhealthy plants. The produce of the selected plants is dug early and if the yield is satisfactory, all the tubers are retained for planting in a select block the following season. The number of plants selected is limited to that which can be handled satisfactorily. It is best to plant tubers from each selected plant separately in a "tuber unit" the following season; then, if any plant in the unit shows symptoms of disease, the whole unit is eliminated. The remaining plants are harvested in the usual manner and the produce used for planting a larger area the following season. The selection of individual plants may be repeated each season, or normal rogueing undertaken to maintain the health of the line.

Pollination: The Importance of Honey Bees

PRIMARY production must always be based on the elementary processes of plant regeneration and growth in which the vital link is the pollination of flowers. It is important that those engaged in agriculture should be familiar with the relationship that exists between insects, the elements, and flowers. In this article I. W. Forster, Apiary Instructor, Department of Agriculture, Oamaru, explains the principles of plant fertilisation and the relative value of the various pollinating agents.

[*Robertson photo.*

Honey bee working red clover.

THE sexual organs of plants are in the blossom, and, although there are many diverse types of bloom, they usually conform to a general plan of construction. Within the petals are the stamens, which carry the anthers in which are the pollen grains containing the male cells. In the centre of the flower is the stigma, carried on the top of the style, which is connected to the ovary in the calyx, at the base of the flower.

Pollination is the transference of pollen from stamens to stigmas. When this has been achieved under the right conditions a tiny thread grows down from the pollen grain into the ovary and when contact is made with the ovule the male regenerative cell descends the tube and fertilisation takes place.

Though some flowers are self-fertile, that is, they can be fertilised by their own pollen, others must have pollen from another flower on the same plant or from another plant of their species.

As the flowers of so many plants have both male and female organs in close proximity, it might appear that self-fertilisation would predominate among hermaphrodite plants. Though it does occur to some extent, it is not desirable and extensive observation and experiments have shown that even in varieties that are capable of self-fertilisation plants derived from seeds which are the product of cross-pollinated flowers are, in most cases, more robust and endowed with greater productivity than those grown from the seed of self-fertilised flowers.

Flowering plants have many devices which are calculated to secure a preponderance of cross-fertilisation over self-fertilisation; for instance, plants that bear the catkin type of flower, such as the willow, are divided into two sexes, one bearing male flowers and the other female, which of course ensures cross-pollination.

Because pollen grains cannot themselves move, it is obvious that they must be transmitted from flower to flower by some external agency.

Wind-pollinated Plants

Wind-pollinated plants are called "anemophilous" ("anemos", the wind; "philos", loving) and have flowers with special characteristics to fit them for wind pollination. The stigmas are usually large and feathery and specially adapted to catch the floating pollen grains. The pollen is dry and light and usually produced in large quantities. In this group are most cereals, many tall-growing grasses, and some trees and shrubs. As these plants do not rely on insects to effect pollination, no inducement is offered to encourage their visits. The flowers are generally small, inconspicuous, without scent, and yield no nectar. At times bees do collect pollen from some anemophilous plants, but this is usually when there is no other source of supply.

As insects play no direct part in the reproduction of wind-pollinated plants, it may appear that cereals, for instance, could be produced indefinitely in an insectless countryside. However, the rotation of crops, which is essential if soil is not to be exhausted, cannot be operated without the inclusion of many insect-pollinated plants, most important of which are the nitrogen-fixing legumes. Indirectly, then, insect pollinators are vital to the welfare of all plant life.

Insect-pollinated Plants

This vast order of plant life designated "entomophilous" ("entomon", an insect; "philos", loving) depend almost entirely on insects for pollination and have flowers that are specially adapted to encourage and assist insects to carry out this vital function. Such flowers are usually coloured and sweet scented and secrete nectar as an inducement to the various insects to visit them. The pollen grains are less abundant than in wind-pollinated flowers and they have a sticky surface which enables them to cling readily to the bodies of insects. The stigmas of such flowers are comparatively small and are often covered with a viscous substance to which the pollen readily adheres. These stigmas are quite delicate and their ability to function can be impaired easily by their being bruised, such as by boisterous weather, or by becoming clogged with dust. Fertilisation is retarded in flowering crops that are exposed to high winds or to drifting dust.

It is vital to the perpetuation of this vast order of plants that ample numbers of suitable insects should be available to transmit pollen from bloom to bloom.

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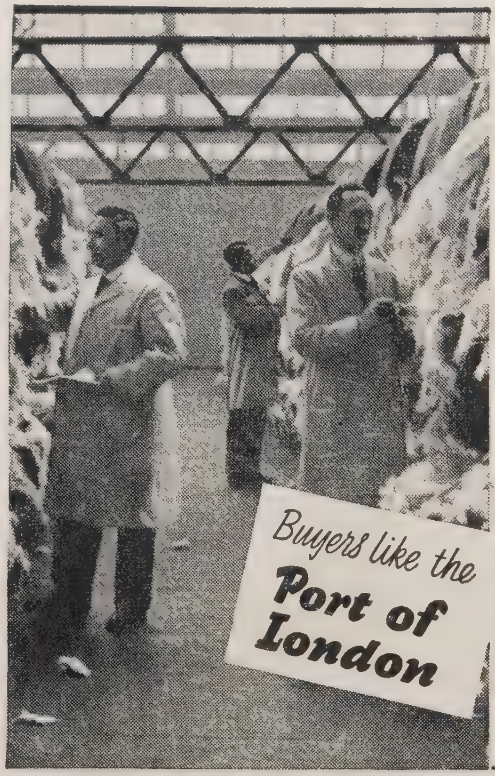

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Honey Bees as Pollinators

The honey bee is undoubtedly the most dependable and efficient pollinator in agriculture. It is unique in that, though it is not domesticated, it is amenable to control and is regularly husbanded in almost every climate and condition that will support plant growth. The number of bees thus remains fairly stable and colonies can be concentrated quickly in areas where abundant flora requires to be worked.

As continuous colonies, which at times comprise about 60,000 individuals, are maintained by honey bees throughout the year, large numbers of field bees are always available to work flowers whatever time flowers are in bloom.

The honey bee is dependent on flowers for all its food, honey and pollen supplying its full diet. To maintain a continuous supply of these two foods large quantities are stored, which means that the field activities of honey bees are not governed by immediate needs. Indeed, the highly developed acquisitive instinct of bees drives them out to visit flowers continually to seek pollen and nectar to add to their stores.

Specially Adapted for Carrying Pollen

This interdependence of bees and flowers has resulted in bees having bodies specially adapted for carrying pollen and nectar, and the well-planned arrangement of hairs on honey bees' legs and bodies is ideal for pollination work.

Hive honey bees never mutilate flowers, fruit, or plant foliage; their mandibles are toothless appendages incapable of being used for such purposes. Hive bees will use a short cut to nectar in a flower through holes already made by other insects or will collect juices from fruit already cracked or punctured, but they are only exploiting prior damage done by some other agent.

Honey bees work almost exclusively on one variety of flower at each trip and the few bees that return with a variegated load usually have a minor portion only of a second pollen mixed with the main variety. The steady working of one type of flower at a time is a valuable trait, because it keeps the various plant species pure. Furthermore, the bees' habit of flying out some distance in flight lanes before dispersing to visit flowers ensures the greatest possible coverage with a maximum amount of cross-pollination among the members of particular species of plant.

Control from Hive

What flowers will be worked by the bees from a hive is determined by the searchers, who are experienced field bees that locate sources of nectar and pollen. On returning to the hive the control bees indicate the source of supply, and sufficient field bees are induced to go out and gather the food offering. If the supply from that source increases, more bees visit it and the reverse applies if the supply dwindles. This control from the hive accounts for honey bees working only one species of flower at each trip. The occasional mixed pollen load is probably brought in by a searcher who has tried two sorts of flower to see which offers more food.

Pollination Service is Free

In most districts honey bees are worth keeping for the honey and beeswax they produce. This means that their most important work, pollination, is available to mankind free. That pollination is their greatest service is shown by the following, which is based on statistics compiled by the United States of America Department of Agriculture.

[*Robertson photo.*

Honey bee with loaded pollen baskets. It has visited many flowers to gather such a load of pollen.

It has been estimated that 75 per cent. of all returns from various crops requiring insect pollination are due to the work of honey bees. Although honey bees are instrumental in pollinating more than 50 agricultural crops, only the value of 25 which are shown in the statistics are taken into consideration. The total value of these crops was 1,300,000,000 dollars, of which nearly 1,000,000,000 dollars can be attributed safely to the work of honey bees. As the honey and beeswax for the same period was worth 35,000,000 dollars, the pollination service performed was worth at least 28 times more to the country than beekeepers' returns from honey and beeswax.

In most parts of New Zealand there are ample honey bees to give a satisfactory pollination service and commercial beekeepers are capable of maintaining the bee population under reasonable conditions. However, honey bees, with their keen foraging habits, are at times most vulnerable to poisonous sprays and dusts, and with the discovery of new methods of application which give greater coverage this danger has increased. It is essential, therefore, that thought should always be given to the welfare of beneficial insects before sprays or dusts are applied indiscriminately.

Specialised Work

Some farmers may think that they should obtain a few hives of bees to keep up the bee population in their locality, but it should be remembered that beekeeping, always specialised work, is today an even more exacting occupation under the conditions imposed by modern agriculture, which usually provides such a short honey flow that only expert apiarists can exploit it.

Unless a farmer is prepared to make a full study of beekeeping and so be able to rear young queens, control swarming, deal with bee diseases, and perform many other manipulations, he will probably do only harm to the bee population of his district and will himself suffer financial loss and personal disappointment.

Honey Bees and Red Clover

The ability of honey bees to pollinate red clover is a subject that has aroused much interest in recent years. Red clover is almost completely self-sterile and, being entomophilous, it depends on insects for pollination. The average red clover floret is about 10 mm. deep, and as the tongue of the honey bee is about 7 mm. long it may appear at first that the difference of 3 mm. would preclude the honey bee working red clover, but it does gather nectar from this source. The honey from this source has a characteristic delicate flavour and is produced in fair to large quantities in parts of Otago and Southland. A sample of honey representing several tons was tested recently by the Botany Division of the Department of Scientific and Industrial Research and was found to contain 83 per cent. of red clover pollen.

The 3 mm. discrepancy is overcome by the nectar rising high enough in the floret for the bee to reach down to it with its tongue.

Honey bees also gather much pollen from red clover, and as pollen gatherers obtain only as much as will stick to the hairs of their bodies at each visit, they do not linger in the blossom and consequently enter many flowers to obtain a full load of pollen. Red clover as a source of pollen is at times very satisfactory to honey bees and the amount of pollination achieved by bees employed on pollen-gathering duty is very considerable.

Bright Colour No Attraction

However, when competing flora of a type more desirable to them is available, honey bees will forsake red clover. They will pass over fields ablaze with red to work more insignificant flowers that can provide a more readily accessible supply of nectar and pollen. This is dictated by the ruthless efficiency of the system that bees have had to develop to survive, and by their instincts.

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The bright colour of red clover is no great attraction, as tests have indicated that red appears no more showy to the honey bee than dull brown.

Though bees do not specialise in working red clover, their highly developed social system enables them to be on hand promptly whenever red clover has something to offer, and the large numbers of individuals available for work means that much can be achieved in a short time.

* Findings by the United States Department of Agriculture from detailed observations over a period of 3 years in Henry County indicate that 82 per cent. of red clover pollination is performed by honey bees, 15 per cent. by bumble bees, and 3 per cent. by other insects.

Bumble Bees as Pollinators

The bumble bee queen starts her nest in spring by laying a small circle of eggs on a knob of pollen which she has gathered and placed in such shelter as an old mouse burrow or the hollow stump of a tree containing fragments of moss or leaves, etc. These first eggs are worker eggs, which the queen hatches with the warmth of her own body. As the number of workers increases the queen is relieved of all duties except egg laying, which she continues doing, until by mid-summer a colony of 200 to 300 has been built up. In autumn the final brood cycle comprises queens and drones only. These mate, the old nest dies out, and the young queens go into hibernation in some dry cosy place under a hedge or bush.

[Robertson photo.

Long-tongued bumble bee (*Bombus ruderatus*) working red clover in orthodox manner. This species has two yellow bands between its waist and neck.

[Robertson photo.

Short-tongued bumble bee (*Bombus terrestris*) working through a hole bitten in the base of a red clover floret. This species has only one yellow band between its waist and neck.

Bumble bees are effective pollinators and their bodies are well suited for the work. They require both nectar and pollen to maintain themselves and their brood, and although their nesting system allows only a very small quantity of food to be stored, bumble bees are in the field constantly during that period when the colony is functioning.

Unfortunately bumble bees are not always constant on one species of flower and many of them return from the field with mixed pollen loads. This tends to cause indiscriminate crossing of plants, which is not desirable.

Imported for Red Clover Pollination

It was for red clover pollination that bumble bees were imported and they have given excellent service in this field of work. As red clover is usually grown in large continuous areas, bumble bees are unlikely to have cause to indulge in the bad habit of visiting several types of flower promiscuously, and because red clover is naturally attractive to bumble bees, competing flora is not likely to claim their attention when red clover is in flower.

The fact that bumble bees often bring in composite pollen loads indicates that they do not have a very highly developed system of unified control. This absence of organised effort results in many young and inexperienced bumble bees wearing themselves out looking for what food

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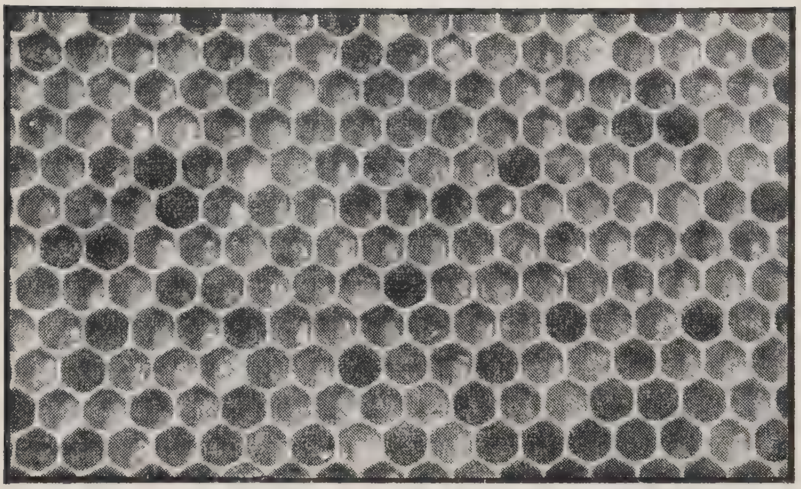
* Extension Bulletin 253, Department of Zoology and Entomology and Agronomy, Ohio State University.

POLLINATION WORK OF HIVE BEES



[*Robertson photo.*

Honey bees require much pollen and store large quantities in their combs.

is offering when the honey bee colony in the same position would make the most economic use of its bee strength.

Species

The three or four species of bumble bee at present in New Zealand include the long-tongued and the short-tongued varieties. Unfortunately, the latter variety when unable to reach down to the nectar in a flower will often bite through the base of the corolla tube and thus not only fail to pollinate the flower but, by mutilation of the blossom, prevent other insects from carrying out that service.

Present indications are that the bumble bee population is on the decline. This can be attributed to several factors inseparable from modern farming. The excessive flooding and erosion that has been a feature of recent times takes heavy toll of both wintering queens and underground nests. The clearing of vegetation which has in the past provided cover must tend to drive the remaining bumble bees into places where they are most vulnerable to the elements and other hazards. The clearing of mixed flora has also made the supply of pollen and nectar uncertain at that time of the year when bumble bees are entirely dependent on food available in the field for the founding of the new season's nest. This is serious, as a queen awakening from hibernation must be able to find nectar or she will die. The clearing of mixed flora is likely to be accelerated in the future by the wider use of new-type weedkillers and modern machinery.

The loss of the cover formerly provided by weed growths and bush is to some extent being made good by the planting of trees and hedges. However, these new plantings are mostly of conifers and other growths of a type that do not produce the early nectar and pollen which is so vital to the bumble bee when establishing its nest.

Many hibernating bumble bee queens fall prey to predatory rodents, and this hazard is unlikely to diminish except by the destruction of that cover growth so vital to the welfare of the bumble bee.

Other Insects

Many insects visit flowers to a greater or less extent, but a brief study of their anatomy and habits shows their limitations and potential values as pollinators.

Insects such as beetles and thrips visit flowers occasionally, but as their bodies are not well adapted for the transmission of pollen, they are of no importance to agriculture as pollinators. Flies, butterflies, and moths visit flowers, but the amount of pollination performed by them is of little value to agriculture.

Moths and butterflies have long, sucking tongues, which coil and uncoil like watch springs. As certain plants have flowers that are specially adapted to the anatomical peculiarities of these insects, they usually concentrate on such plants and do not enter very prominently into the general pollination plan as it affects agriculture.

Solitary Bees

There are so few solitary bees in New Zealand that they are barely worth mention. They are, however, anatomically suitable for pollination purposes, and although they do not live communal lives, they mother their young and require food from day to day. This drives them to visit flowers continuously in search of pollen and nectar.

Conclusion

1. Insect pollination is essential to New Zealand's agriculture.
2. The honey bee is at present doing the bulk of plant pollination and is likely to continue to do it.
3. The honey bee population is most secure if tended by skilled apiarists.
4. It is in the interests of all that nothing should be done to endanger the welfare of honey bees either in the field or in the hives.
5. Although the long-tongued bumble bees are capable of giving excellent service in red clover fields, their existence is rather precarious and conditions for them are unlikely to improve.
6. The inclusion of more early nectar- and pollen-producing plants in plantations and hedges may help to stabilise the bumble bee population.

DAIRY PRODUCE GRADED FOR EXPORT DURING OCTOBER

THE following figures showing quantities of dairy produce graded for export during October and for the 3 months ended October 31, 1950, with comparative figures for the same month and 3-monthly period of last year, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER—

		Tons			Tons
Period	Creamery	Whey	Total	Percentage Inc. or dec.	Total in store at end of mth.
October, 1950	20,886	391	21,277	—	31,419
October, 1949	20,141	353	20,494	—	23,656
Increase or decrease	+745	+38	+783	+3.820	+7,763
For 3 months ended 31/10/50	43,936	786	44,722	—	—
For 3 months ended 31/10/49	45,283	732	46,015	—	—
Increase or decrease	—1,347	+54	—1,293	—2.809	—

CHEESE—

		Tons			Tons
Period	White	Coloured	Total	Percentage Inc. or dec.	Total in store at end of mth.
October, 1950	12,631	—	12,631	—	17,259
October, 1949	8,820	2,516	11,336	—	14,357
Increase or decrease	+3,811	—2,516	+1,295	+11.423	+2,902
For 3 months ended 31/10/50	20,701	1,223	21,924	—	—
For 3 months ended 31/10/49	15,747	4,498	20,245	—	—
Increase or decrease	+4,954	—3,275	+1,679	+8.293	—

If these figures are converted into butterfat equivalent, there is a decrease of 1.016 per cent. in butterfat graded for the 3 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Herbage Production of Short-rotation Ryegrass

Eight Years' Production Records from a Trial at the Marton Experimental Area

By P. B. LYNCH, Crop Experimentalist, Department of Agriculture, Wellington.

IN producing short-rotation ryegrass the Grasslands Division of the Department of Scientific and Industrial Research made a notable contribution to the farming economy of New Zealand. Since its release to farmers in 1943 short-rotation ryegrass has rapidly grown in popularity so that today some 100,000 bushels of seed are produced each year, of which approximately 75 per cent. is sown within the Dominion. Farmers' experience with short-rotation ryegrass, together with the results of many years of experimentation, has shown that it can produce at a high level and be fairly persistent under conditions of reasonably high soil fertility, good moisture supply, and satisfactory management, by which is meant more particularly the avoidance of over-grazing, especially in summer and autumn.

THE purpose of this article is to present results to date from a trial with short-rotation ryegrass which has been in progress at the Marton Experimental Area for the past 8 years.

Details of Trial Area

The trial area was ploughed out of grass in 1940 for a swede crop in 1940-41. After the swedes it was ploughed in September, 1941, worked down, and sown to grass on October 30, 1941. The soil type (Wanganui loam) is not particularly fertile and is typical of thousands of acres of terrace and gently rolling downs between Wanganui and Palmerston North. Rainfall is not high, the average being about 35in. per annum, and the district is liable to dry spells in summer, the effects of which are magnified by persistent winds so that the soil dries out and cracks badly. At the same time some type of drainage is essential, for water does not run freely through the soil and the subsoil is a heavy, compact clay loam. The country is ideally suited to mole draining and the Marton area was thoroughly mole drained shortly after the trial began.

TABLE 1: YIELDS OF DRY MATTER OF PASTURE HERBAGE IN YEARLY PERIODS

Year	Actual period	Yields of dry matter (lb. per acre)			Yields relative to Field 1 (perennial ryegrass) = 100	
		Field 1 Perennial ryegrass	Field 2 Perennial and short-rotation ryegrass	Field 3 Short-rotation ryegrass	Field 2	Field 3
1942 (18 months)	12-1-42 to 25-8-42	2,971	4,120	4,388	138.7	147.7
1942-43 ..	26-8-42 to 1-9-43	8,548	8,402	7,227	98.3	84.5
1943-44 ..	2-9-43 to 29-8-44	8,722	9,536	9,728	109.3	111.5
1944-45 ..	30-8-44 to 27-8-45	11,955	12,490	13,539	104.5	113.3
1945-46 ..	28-8-45 to 19-8-46	10,062	10,812	10,365	107.5	103.0
1946-47 ..	29-8-46 to 16-9-47	10,243	11,271	9,522	110.0	93.0
1947-48 ..	17-9-47 to 30-8-48	5,516	6,239	5,869	113.1	106.4
1948-49 ..	31-8-48 to 16-8-49	10,978	11,905	11,568	108.4	105.4
Totals (8 years)	12-1-42 to 16-8-49	68,995	74,775	72,206	108.4	104.7

The spring sowing to grass used in the trial is not the usual practice, but was adopted in this case to obtain a sward as quickly as possible. Fortunately it proved very successful and a highly productive sward was soon obtained on all treatments. Particularly for short-rotation ryegrass, spring sowing is not advocated today, because the grass enters into a relatively dormant period in summer and autumn and consequently cannot offer strong competition to weeds or other pasture species at this critical time, shortly after sowing. At the time the trial was sown, however, the behaviour of the plant in this respect was not fully appreciated.

The strain of short-rotation ryegrass then available for trial is not considered as persistent as that being released at present, but as will be shown this fact has not prevented the strain sown persisting as a valuable and productive element of the sward for more than 8 years.

The grazing management has at all times been rotational grazing with sheep. All trial fields have carried over the last 7 years on the average about 28,000 sheep days per acre, which works out at approximately 11 dry sheep per acre average daily carrying capacity. This high figure has been possible with the first-class herbage utilisation which can be obtained with small trial fields (½ acre each) and probably could not be duplicated on a farming scale. At no time has the grass been allowed to reseed. This policy has been adhered to in an endeavour to establish the persistency of short-rotation ryegrass without reseeding.

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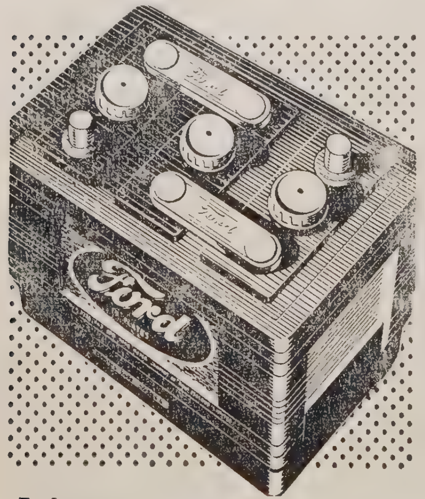

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Topdressing has been as follows:—

- At sowing, 3cwt. of superphosphate per acre;
- 15-5-42, 3cwt. of superphosphate per acre;
- 23-3-43, 3cwt. of serpentine superphosphate per acre;
- 20-7-44, 1cwt. of superphosphate per acre;
- 5-4-45, 1cwt. of superphosphate per acre;
- 12-3-46, 2cwt. of superphosphate per acre;
- 4-3-47, 3cwt. of superphosphate per acre plus 5cwt. of lime per acre;
- 25-6-48, 3cwt. of superphosphate per acre plus 5cwt. of lime per acre;
- 3-5-49, 3cwt. of superphosphate per acre plus 5cwt. of lime per acre.

Treatments and Technique

The trial consists of 3 fields, each of ½ acre, and the following seeds mixtures were sown:—

Field 1: Certified Pedigree perennial ryegrass, 40lb. per acre; Certified Pedigree white clover, 3lb. per acre.

Field 2: Short-rotation ryegrass (ex-Grasslands Division), 20lb. per acre; Certified Pedigree perennial ryegrass, 20lb. per acre; Certified Pedigree white clover, 3lb. per acre.

Field 3: Short-rotation ryegrass (ex-Grasslands Division), 40lb. per acre; Certified Pedigree white clover, 3lb. per acre.

Complete grazing records are kept and herbage production is measured by 3 movable cages in each field. The technique adopted allows measurement of growth within the cages by mowing, the cages being shifted at random about the field after each mowing and weighing so that no changes in sward composition occur such as might result from constant mowing of the same areas. Cutting is made when the herbage is at sheep grazing height or a little higher. Herbage samples are secured at each cut for dry-matter determinations and for dissection into pasture species composition at the Rukuhia Soil Research Station (Hamilton).

Fig. 1A—Relative dry-matter yields.

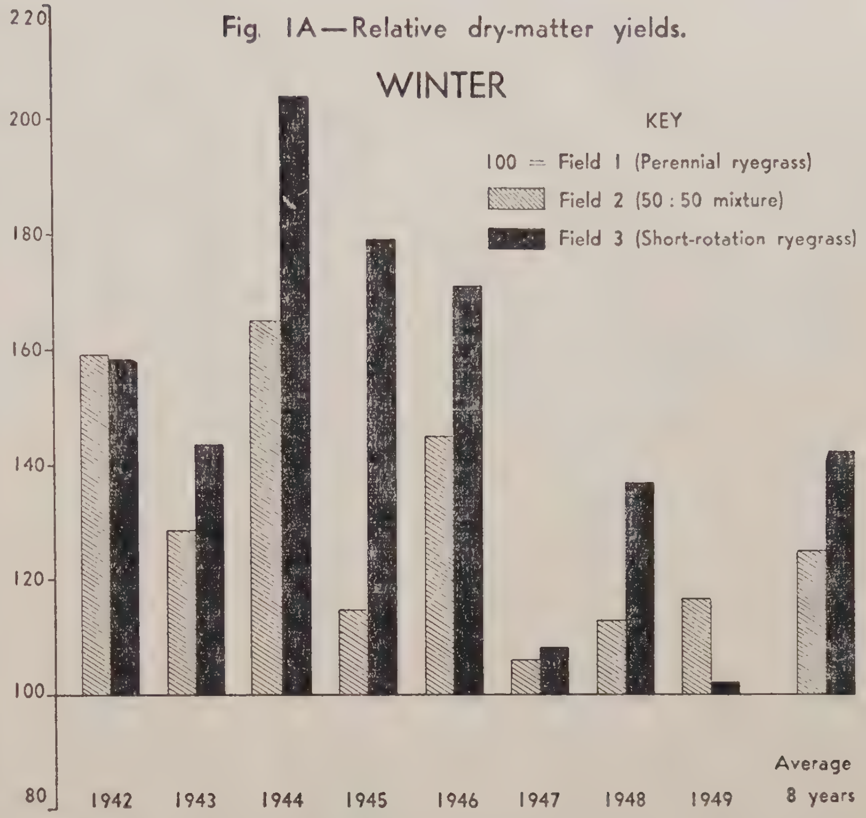


TABLE 2: SHEEP DAYS PER ACRE IN YEARLY PERIODS

Year	Actual period	Sheep days per acre			Sheep days relative to field 1 Field 1 = 100	
		Field 1	Field 2	Field 3	Field 2	Field 3
1942	4-2-42 to 25-8-42	2,524	2,689	2,714	106.5	107.3
1942-43 ..	26-8-42 to 1-9-43	3,544	3,559	3,615	100.4	102.0
1943-44 ..	2-9-43 to 29-8-44	2,966	3,005	2,949	101.3	99.4
1944-45 ..	30-8-44 to 27-8-45	3,574	3,751	3,991	104.9	111.7
1945-46 ..	28-8-45 to 19-8-46	2,388	2,466	2,389	103.3	100.0
1946-47 ..	20-8-46 to 16-9-47	4,277	4,332	3,920	101.3	91.6
1947-48 ..	17-9-47 to 30-8-48	3,757	3,873	3,814	103.1	101.5
1948-49 ..	31-8-48 to 16-8-49	4,710	4,753	5,125	100.9	108.8
Totals (8 years)	4-2-42 to 16-8-49	27,740	28,428	28,517	102.5	102.8

TABLE 3A: HERBAGE PRODUCTION FOR 3 WINTER MONTHS (JUNE-AUGUST)

Year	Yields of dry matter of herbage in pounds per acre, and yields relative to field 1 (perennial ryegrass) = 100				
	Field 1 (perennial ryegrass)	Field 2 (50:50 mixture)		Field 3 (short-rotation ryegrass)	
	Yield	Yield	Relative to (1) = 100	Yield	Relative to (1) = 100
1942	498	792	159	790	158
1943	1,280	1,646	129	1,843	144
1944	853	1,405	165	1,736	204
1945	954	1,094	115	1,707	179
1946	1,032	1,493	145	1,779	172
1947	1,962	2,085	106	2,115	108
1948	1,422	1,608	113	1,974	137
1949	1,555	1,822	117	1,591	102
Average (8 years)	1,194	1,493	125	1,694	142

Herbage Production: Yearly Totals

Table 1 gives the yearly totals for dry-matter production for the 8 years of the trial to date.

For the 8-year totals and for the last 4 years of the trial the highest-yielding field has been the 50:50 mixture of short-rotation and perennial ryegrasses (field 2). The short-rotation ryegrass field (3) is intermediate between this field and the perennial ryegrass pasture.

Table 2, which shows the sheep days per acre of each field for the approximate periods as Table 1, indicates a slight superiority of both the 50:50 mixture and the short-rotation ryegrass fields over the perennial ryegrass field, but very little difference between the mixture and the short-rotation ryegrass swards.

The herbage production figures probably give a more accurate comparison among treatments than the sheep grazing days, but both agree that there is little difference in total production among the three fields, although the two fields with short-rotation ryegrass in the sward have been slightly superior to the perennial ryegrass field. As will be shown in a later section ryegrass was the dominant species in all three fields, which were very similar in species composition for pasture plants other than the ryegrass.

Production in Seasonal Periods

The merit of short-rotation ryegrass is not considered to be greater total production than perennial ryegrass, but greater production in the critical winter and early-spring months. The

TABLE 3B: HERBAGE PRODUCTION FOR 3 SPRING MONTHS (SEPTEMBER-NOVEMBER)

Year	Yields of dry matter of herbage in pounds per acre, and yields relative to field 1 (perennial ryegrass) = 100				
	Field 1 (perennial ryegrass)	Field 2 (50:50 mixture)		Field 3 (short-rotation ryegrass)	
	Yield	Yield	Relative to (1) = 100	Yield	Relative to (1) = 100
1942	3,799	3,254	86	2,418	64
1943	4,126	4,351	105	4,180	101
1944	4,594	4,765	104	5,084	111
1945	3,825	3,728	98	3,579	94
1946	2,852	3,274	115	3,200	112
1947	3,116	3,304	106	2,915	94
1948	4,676	5,040	108	5,359	115
1949	4,008	4,625	115	4,121	103
Average (8 years)	3,874	4,043	104	3,857	99

TABLE 3C: HERBAGE PRODUCTION FOR 3 SUMMER MONTHS (DECEMBER-FEBRUARY)

Year (includes December of previous year)	Yields of dry matter of herbage in pounds per acre, and yields relative to field 1 (perennial ryegrass) = 100				
	Field 1 (perennial ryegrass)	Field 2 (50:50 mixture)		Field 3 (short-rotation ryegrass)	
	Yield	Yield	Relative to (1) = 100	Yield	Relative to (1) = 100
1942	973	1,542	158	1,648	170
1943	2,119	2,165	102	1,774	84
1944	2,121	2,141	101	1,990	94
1945	3,989	4,201	105	4,445	111
1946	2,658	2,934	110	2,462	93
1947	2,883	2,994	104	2,294	80
1948	759	1,014	134	674	89
1949	2,848	2,784	98	2,778	98
Average (8 years)	2,294	2,472	108	2,258	98

pasture production figures have therefore been considered in seasonal periods in Tables 3A, 3B, 3C, and 3D and these tables have been illustrated by Figs. 1A, 1B, 1C, and 1D.

The seasons taken have been according to the following classification with minor variations resulting from varying dates of cutting:—

Winter: June, July, August (Table 3A: Fig. 1A).

Spring: September, October, November (Table 3B: Fig. 1B).

Summer: December, January, February (Table 3C: Fig. 1C).

Autumn: March, April, May (Table 3D: Fig. 1D).

Winter Production

The winter production of herbage in each year is given by **Table 3A** and illustrated by **Fig. 1A.**

The superiority in winter months of the fields containing short-rotation ryegrass is very marked, more especially in the first 5 years of the trial, when it is likely that the proportion of this species was greater than in the last 3 years. Unfortunately this cannot be definitely established, as it is impossible to distinguish between the two species when dissecting the mown herbage. In early spring short-rotation ryegrass can be distinguished from perennial ryegrass in the field by a more vigorous growth and frequently a lighter-green colour, and this fact has made it possible to assert that fields 2 and 3 still contain a considerable proportion of short-rotation ryegrass. But it has not been possible to give numerical data to support these statements.

The superior winter production of short-rotation ryegrass is without doubt one of its major advantages. To indicate more clearly the months when this superiority occurs the yields of the short-rotation ryegrass (field 3) relative to those of the perennial ryegrass (field 1) have been examined in monthly periods. Excluding 1942, which gave abnormal results, probably because of the time of sowing of the trial, the following figures are the means for the 7 years since 1942: January, 97; February, 97; March, 99; April, 106; May, 101; June, 143; July, 167; August, 146; September, 118; October, 94; November, 99; December, 91.

TABLE 3D: HERBAGE PRODUCTION FOR 3 AUTUMN MONTHS (MARCH-MAY)

Year	Yields of dry matter of herbage in pounds per acre, and yields relative to field 1 (perennial ryegrass) = 100				
	Field 1 (perennial ryegrass)	Field 2 (50:50 mixture)		Field 3 (short-rotation ryegrass)	
	Yield	Yield	Relative to (1) = 100	Yield	Relative to (1) = 100
1942	1,500	1,786	119	1,950	130
1943	1,349	1,337	99	1,192	88
1944	1,622	1,639	101	1,821	112
1945	2,417	2,430	100	2,303	95
1946	2,548	2,657	104	2,546	100
1947	2,547	2,917	114	1,913	75
1948	220	312	142	306	139
1949	1,898	2,260	119	1,841	97
Average (8 years)	1,763	1,917	109	1,734	98

TABLE 4: PRODUCTION OF RYEGRASS IN YEARLY PERIODS

Year	Actual Period	Field 1 (perennial ryegrass)		Field 2 (perennial and short-rotation ryegrass)		Field 3 (short-rotation ryegrass)	
		Lb./acre	Per cent. of total yield	Lb./acre	Per cent. of total yield	Lb./acre	Per cent. of total yield
1942 ..	12-1-42 to 25-8-42	2,582	87	3,783	92	4,166	95
1943 ..	26-8-42 to 1-9-43	6,863	80	6,444	77	5,942	82
1944 ..	2-9-43 to 29-8-44	7,080	81	6,856	72	6,445	66
1945 ..	30-8-44 to 27-8-45	8,932	75	8,399	67	10,350	76
1946 ..	28-8-45 to 19-8-46	6,463	64	6,381	59	7,897	76
1947 ..	20-8-46 to 16-9-47	7,689	75	7,986	71	7,074	74
1948 ..	17-9-47 to 30-8-48	4,462	81	4,948	79	4,490	76
1949 ..	31-8-48 to 16-8-49	7,021	64	7,251	61	7,666	66
Average (8 years)		6,387	74	6,506	70	6,754	75

From June to August inclusive the short-rotation ryegrass field has yielded more than 40 per cent. above the perennial ryegrass field. By October, however, it has declined to 6 per cent. less than perennial ryegrass.

Spring Production

Table 3B and **Fig. 1B** show, apart from the first year, little differences among the three fields. The early-spring production is relatively small compared with production in October and November and any superiority of short-rotation ryegrass in September is obscured by the later flush of growth of perennial ryegrass. The relatively poor showing in spring, 1942, is difficult to explain, for it is not seen at other seasons of the year. However, it followed a flush of growth of short-rotation ryegrass in the previous summer and autumn (following the spring sowing) and this may have suppressed clover growth temporarily in fields containing that species.

Summer Production

Table 3C and **Fig. 1C** show a tendency for summer production of the short-rotation ryegrass fields to be lower than that of the perennial ryegrass field except in the first year, which, however, covers the period immediately after sowing. Short-rotation ryegrass establishes more rapidly and makes more prolific growth in the first few months after sowing than perennial ryegrass, and this is apparently true both with spring as well as with autumn sowing. Field 2 (50:50 mixture) maintains a slight superiority until 1949. The relatively marked superiority in 1948 occurred in a drought year when the absolute production on all fields was very low.

Autumn Production

Table 3D and **Fig. 1D** show, on the whole, a similar picture to that of the summer production. In 1948 the low summer production was followed by exceptionally low autumn growth in one of the worst droughts experienced at Marton. The relative production figures have little meaning in such circumstances.

The foregoing data on the trial may be summarised as follows:—

1. The short-rotation ryegrass field has given markedly greater herbage yields than the perennial ryegrass field in the winter months, June to August, inclusive, but at other seasons of the year it tends to be slightly inferior.
2. The 50:50 mixture field, though giving slightly less growth than the short-rotation ryegrass field in the winter, gave greater production for the rest of the year than either the perennial ryegrass or the short-rotation ryegrass field.

Ryegrass Production

At each mowing of this trial herbage samples have been secured and these have been dissected so that the percentage of each species present was estimated on a dry-matter basis. Unfortunately it has not been possible to separate short-rotation ryegrass from perennial ryegrass so that a general figure for "ryegrass" is given in Table 4.

After the first year all fields show between 65 and 80 per cent. "ryegrass" and the variation among them in the amount of ryegrass is small. Thus the total production figures may fairly be taken as representative of the ryegrass production in all comparisons made.

In all fields white clover was the main species other than ryegrass, species other than ryegrass or white clover contributing less than 20 per cent. to the total production.

This trial has not been designed to give critical comparisons of total herbage production, as the treatments are not replicated and yields cannot be compared statistically. Further, all comments made apply to pastures dominantly ryegrass (perennial or short-rotation) and white clover. It has shown, however, two main features.

First, short-rotation ryegrass will persist for at least 8 years under sheep-grazing conditions, providing the management is such that the areas can be spelled periodically and fertility maintained by topdressing. Secondly, pastures containing appreciable quantities of short-rotation ryegrass may be expected to give consistently greater production during winter months, June to August, inclusive, than those where perennial ryegrass is the dominant constituent. Although the evidence available cannot be considered conclusive, there is every indication that the yearly production of fields containing short-rotation ryegrass will not be less than those where perennial ryegrass is dominant under conditions similar to those obtaining at Marton.

SHORT-ROTATION RYEGRASS

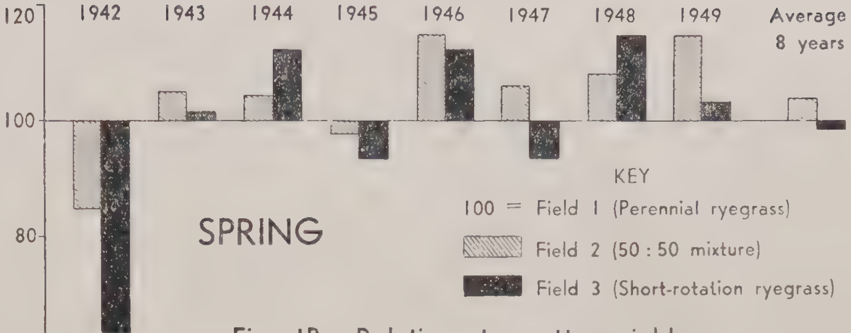


Fig. 1B—Relative dry-matter yields.

Fig. 1C—Relative dry-matter yields.

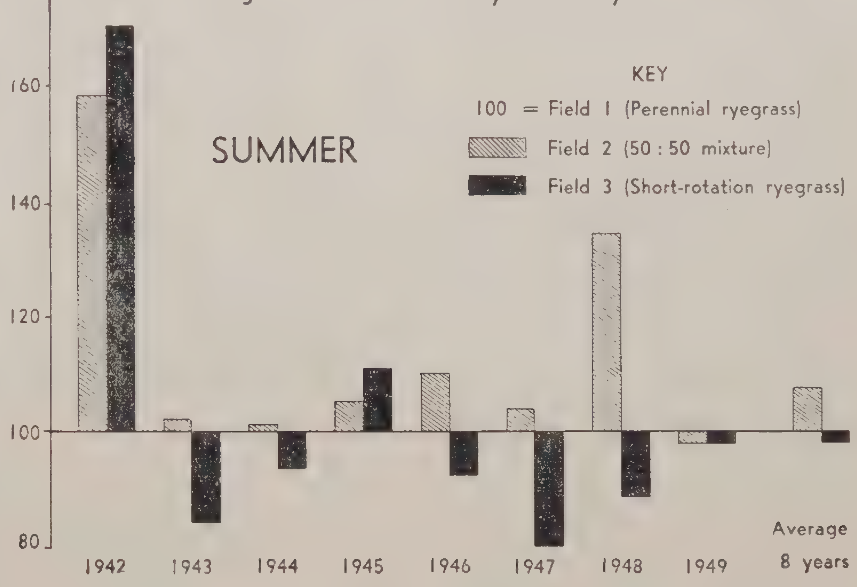
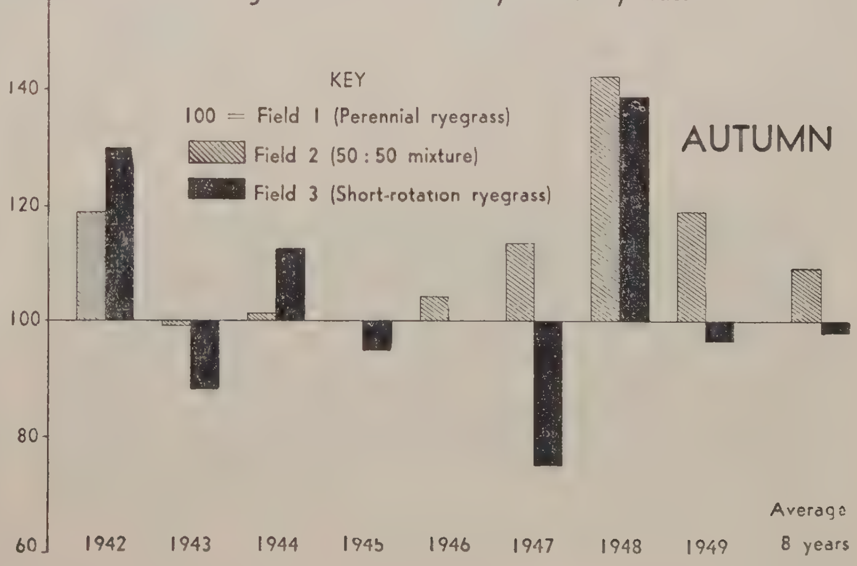


Fig. 1D—Relative dry-matter yields.



Reducing Egg-production Costs on Poultry Farms

WITH the market now adequately supplied with eggs, New Zealand poultry farmers are faced with the problem of maintaining an economic margin between cost of production and price to the consumer. Costs on the farm can be reduced by more efficient management, and in an article in the October "Journal" F. C. Bobby, Superintendent, Poultry Industry, Department of Agriculture, Wellington, offered some suggestions toward attaining that end. Other aspects of this approach to the economics of the industry are discussed in this article.

ANY waste among stock must increase the cost of raising the remaining birds to maturity. The raising of stud cockerels is always a wasteful process, as many more than are required must be brooded and reared to enable the best to be selected for retention. Therefore frequent culling of growing cockerels is common, the weaker birds and those which develop undesirable characters being eliminated.

Management of Cockerels

In view of the present position of the industry poultry breeders should be particularly conscientious and thorough with the culling of this season's cockerels. The sooner undesirable males are culled and sold, the lower will be the food bill chargeable to the stud birds retained.

The best of management is highly desirable for the male birds reared so that they may become vigorous and healthy cockerels for use next breeding season. Well-grown, vigorous cockerels in first-class condition may well bring about improved hatching next year. Any reduction in the number of infertile eggs, dead germs, or chicks dead in the shell is equivalent to a reduction in the cost of rearing pullets. The first steps toward reducing this cost may be taken now by improving the management of this season's cockerels.

Many poultry breeders concentrate on the good management of pullets but give insufficient attention to the cockerels. The pullets are given the best of the housing and free range, the cockerels being relegated to inadequate housing and second-class, semi-intensive conditions. The wastage in rearing cockerels is high and the cost heavy, but they can be reduced by intelligent management.

Parasites

Both internal and external parasites cause substantial losses in pullet flocks every year, but these losses need not occur if management is efficient. The means of controlling parasites are available to any poultry producer at no great cost. Both direct and indirect losses may occur when parasites are permitted to infest growing birds in large numbers.

Worms, if present in quantity in growing pullets, may well result in a loss of birds, and when present as a lighter burden they tend to reduce stamina, which may be reflected in reduced egg production later. These parasites may be mounting in numbers before their presence is detected; often they are detected only when severe damage has been done to the young stock. Therefore poultry producers are urged to make the deworming of pullets a routine operation. Pullets should be dewormed at 10 to 12 weeks of age and again when they are transferred into the laying house. The cost in material is small and the cost in labour often grossly exaggerated: The benefit to the birds can be very great. A flock of pullets is not necessarily free from worms because none of these parasites has been seen in the droppings.

Drenching pullets for worms is as important and necessary as the routine practice of testing future breeding stock for pullorum disease. Both operations are an insurance against later losses.

Red mite should be watched for constantly in housing used for growing pullets and later in the laying houses. In quantity these external parasites lower the constitution and health of birds, thereby affecting first growth and later production. In the rush of a rearing season these parasites can be overlooked until they have effected real damage.

Lice multiply rapidly on birds, particularly during warm weather. Their effect on the birds is less noticeable than that of a heavy burden of worms, but they lower the condition and health of the birds they infest.

The control of poultry parasites was dealt with in an article on pages 155 to 162 of the "Journal" for August, and Bulletin No. 327, "Internal and External Parasites of Poultry", may be obtained free from Poultry Instructors or from the nearest office of the Department of Agriculture. Poultry producers can ill afford to be without a copy of this bulletin for reference purposes.

Marketing

A subject much under discussion by poultry producers at present is the marketing of eggs, and on two aspects of it the farmer can exert a direct influence—wastage of eggs on the farm and the quality of eggs leaving the farm.

Unless reasonable care is exercised during the collecting and packing of eggs many eggs can be cracked or broken and thus rendered unfit for sale at full price. There are three stages at which these losses may occur, the first of which is in the nest boxes if they are not kept properly filled with nesting material. Too little nesting space and consequent overcrowding by birds anxious to lay during the flush season is another weakness in management which leads to broken eggs in the nests. The second stage at which eggs are often cracked, mainly in the form of "hair-cracks", is during collection when too many eggs are placed in the bucket or tin, breakages and cracks being caused by too much pressure on the eggs at the bottom of the container. Finally, carelessness during packing may cause wastage on the farm, particularly if a number of eggs have to be cleaned, and may result in eggs being broken or cracked during the journey to the egg floor. The eggs must be packed firmly in the crates, and eggs which are too large for the fillers almost invariably are cracked or broken.

Now that the market is receiving an adequate supply of eggs—indeed, in some districts an oversupply—poultry producers are naturally anxious that the consumption of eggs should increase and consumers are concerned that the eggs they buy be fresh and of high quality. Quality and price are two of the major factors affecting egg sales. At present the producer cannot greatly affect the price paid to him for his eggs, but he can exert a marked influence on the quality of the eggs leaving his farm. By doing all possible to dispatch a high proportion of fresh, good-quality eggs a producer is assisting not only himself but the poultry industry as a whole.

Economically the situation in the poultry industry is not as easy as during the past few years. Certain economic forces are operating over which the producer has no direct control, but he does have a high degree of control over management on his farm. Increased efficiency which reduces waste or results in more eggs per laying bird a year can go far toward offsetting increased costs of food and other materials.

Pullets are usually given good free range, but frequently cockerels are not so well treated.

POISONOUS PLANTS IN NEW ZEALAND

THIS is the third section of a series of descriptions of poisonous plants which grow in New Zealand by H. E. Connor, Botanist, Department of Scientific and Industrial Research, Wellington. The series is appearing monthly in the "Journal", and glossaries to be used with the series were published with the first section, which appeared in the October issue.

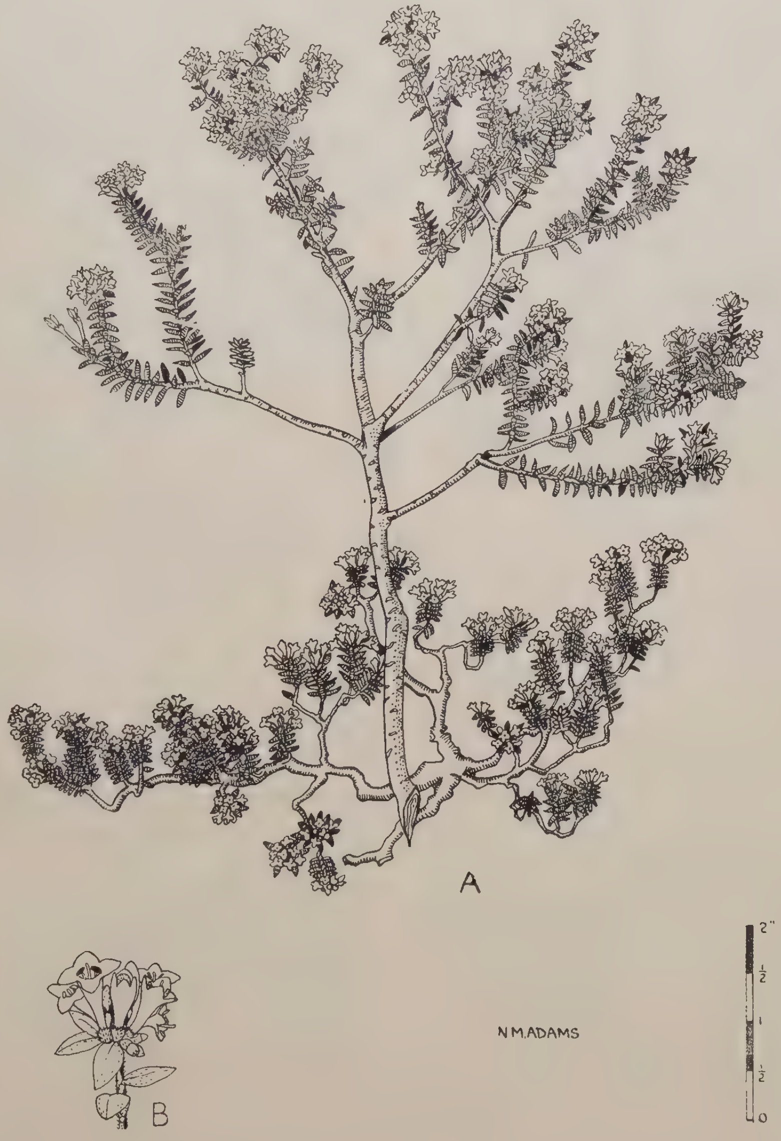


Fig. 5—Strathmore weed (*Pimelea prostrata*). A: Habit. B: Flower.

DICOTYLEDONS

Thymelaeaceae

Strathmore Weed. *Pimelea prostrata* **(Forst.) Willd. (Fig. 5)**

Botanical description: Habit—Small, prostrate, or sub-erect, much branched shrub; branches up to 2ft. long. **Leaves**—Small and crowded to laxly placed. **Flowers**—Small, waxy-white, in few or many flowered heads at the tips of the branches. **Fruit**—A white, ovoid berry. (New Zealand.)

Habitat: Open pastures.

Distribution: Abundant throughout New Zealand from sea level to 4500ft.

General: Poisonings caused by Strathmore weed are more common in horses than in other stock in New Zealand, though calves and yearlings have been known to be poisoned. Poisonings by this plant are not always fatal, but the loss of thrift and the inability of the horses to work may be a serious setback to the farmer. From observations it appears that a tolerance can be built up against Strathmore weed, as horses have been known to recover from poisoning and then graze it occasionally without harmful effects. *P. prostrata* is often seen as the only green plant in dry pastures and is still untouched by stock, even during periods of shortage of feed. There are a number of poisonous *Pimeleas* in Australia.

Symptoms of poisoning: First symptoms in horses are marked depression, loss of appetite, and profuse watery diarrhoea. These are followed by an intense inflammation and soreness of the mucous membranes of the mouth and tongue. The eye and eyelid become distinctly oedamatous and a yellow coloration is visible; at this stage a distinct weakening of the pulse is noticeable. Muscular pains and a strong disinclination to move are prominent symptoms. Post-mortem examination symptoms of poisoning are available only from a fatal case in a horse. The undersurface of the tongue and the mouth showed small vesicles and circumscribed ulcers and a complete destruction of the epithelium. The mucous surface was distinctly yellow and acutely inflamed. In the stomach the lesions seen in the mouth were repeated. The intestines showed many infested areas but no marked lesions. The liver was undergoing fatty degeneration and was pale yellow.

Poisonous principle: The toxin in *P. prostrata* is unknown, but it is possibly in the same class as the poisonous principle of daphne species, which is a narcotic irritant.

Coriariaceae

Tutu. "Toot". Tupakihi. *Coriaria arborea* **Lindsay (Fig. 6)**

Botanical description: Habit—Shrub or small tree, with wide-spreading, 4-angled branches, very variable in

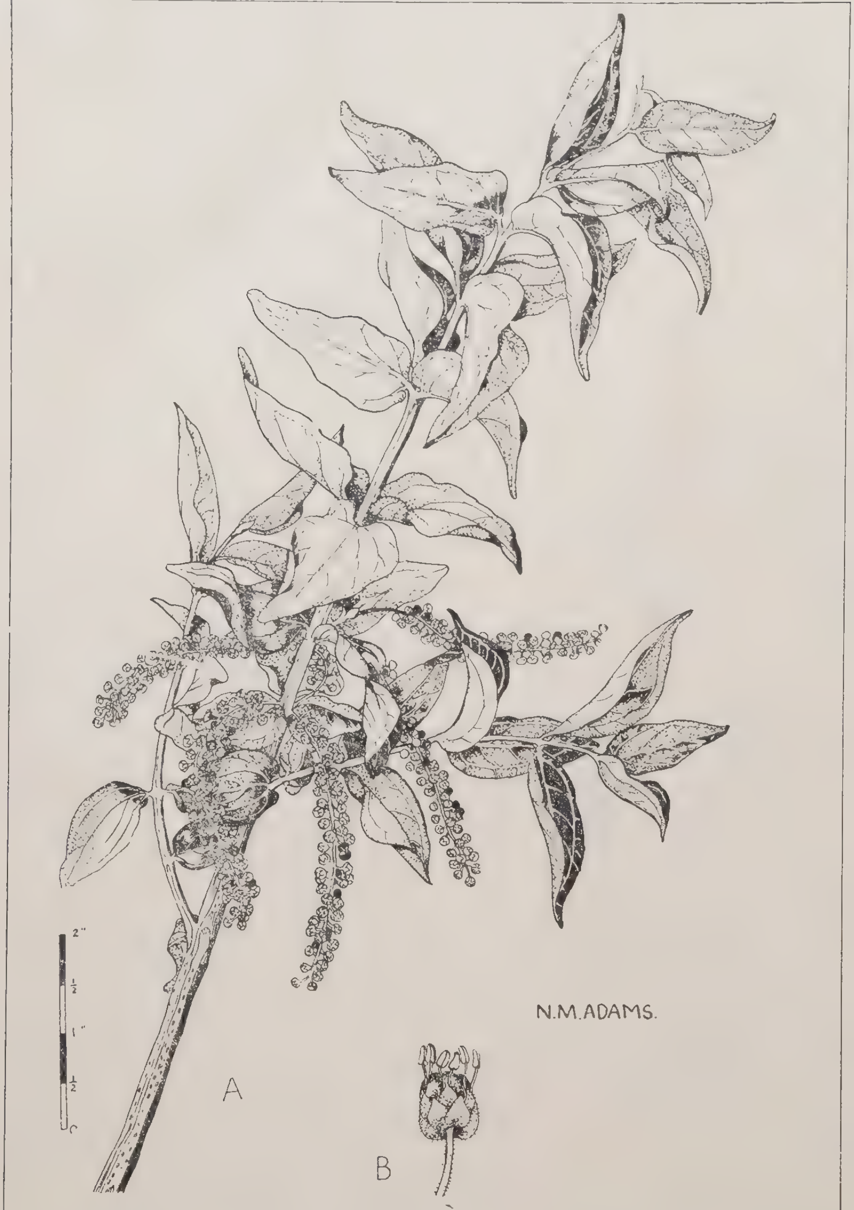


Fig. 6—Tutu (*Coriaria arborea*). A: Habit. B: Flower.

height, sometimes 25ft. tall. **Leaves**—1 to 3in. long, ovate or oblong-ovate, prominently 3 to 5 nerved. **Flowers**—Many on long drooping racemes 4 to 12in. long or more; sepals and petals green. **Fruit**—Purplish black enveloped by the juicy, persistent, enlarged petals. (New Zealand.)

Habitat: Riverbanks, bush, scrub, and tussock grassland.

Distribution: Abundant throughout New Zealand up to 3500ft.

General: Since the earliest records tutu has been responsible for the greatest percentage of plant poisonings of stock in New Zealand. Farmers claimed to have lost up to a quarter of their stock in the early days. Sheep and cattle are the animals mostly affected, as horses apparently do not eat the plant. Goats have been used to eat the plant down, thereby making it safe to run cattle on those areas. Cattle and sheep are also known to eat tutu without any ill effects, possibly because in normal grazing much other fodder is eaten with the tutu. Travelling, hungry stock are more readily poisoned than those which have been accustomed to tutu country. All parts of the plant except the soft, black, persistent petals are poisonous. Poisoning by tutu has been reported in man, and a recent outbreak of honey poisoning was traced to the fact that bees had worked honeydew produced from the sap of tutu.

Symptoms of poisoning: Convulsions and excitement, vomiting and defaecation, and exhaustion, precede a comatose state. Death follows, or may occur during the convulsions.

Poisonous principle: The toxin in tutu is tutin, which is allied to the picrotoxin group of poisonous substances.

Coriaria spp.

Other species of *Coriaria* have not had any specific poisonings attributed to them, but as *C. sarmentosa* Forst. f. was previously confused with *C. arborea*, and as *C. lurida* T. Kirk and *C. angustissima* Hook. f. have been shown to contain tutin, it seems reasonable to treat them as potential poison plants.

SHOW DATES

THE following are dates and venues of A. and P. shows up to the middle of February.

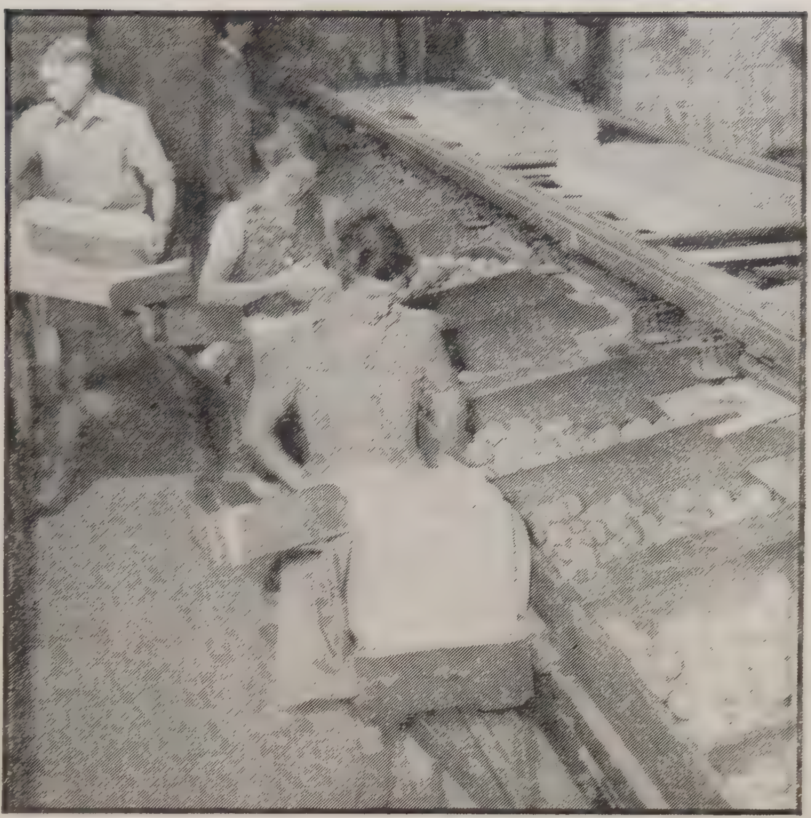
January 1—Nuhaka A. and P. at Nuhaka.
January 12 and 13—Wairoa County A. and P. at Wairoa.
January 13—Blueskin A. and P. at Waitati.
*January 20—Central Hawkes Bay A. and P. at Waipukurau.
January 24—Marton District A. and P. at Marton.
*January 26 and 27—Horowhenua A. and P. at Levin.
January 27—Golden Bay A. and P. at Takaka.
January 27—Helensville A. and P. at Hellensville.
January 27—Waiau A. and P. at Tuatapere.
*January 30 and 31—Feilding A. and P. at Feilding.
February 3—Clevedon A. and P. at Clevedon.
February 3—Rodney Agricultural Society at Warkworth.
February 3—Rotorua A. and P. at Rotorua.
February 3—Banks Peninsula A. and P. at Little River.
February 3—Woodville A. and P. at Woodville.
February 3—Palmerston and Waihemo County A. and P. at Palmerston.
*February 6 and 7—Dannevirke District A. and P. at Dannevirke.
February 9—Dannevirke Ram Fair at Dannevirke.
February 9 and 10—Taranaki Agricultural Society at New Plymouth.
February 10—Hukerenui A. and P. at Hukerenui.
February 10—North Kaipara Agricultural Association at Paparoa.
*February 10—Rangitikei A. and P. at Taihape.
February 10—Pahiatua A. and P. at Pahiatua.
February 10—Katikati A. and P. at Katikati.
February 10—Waitemata A. and P. at Waiwera.
February 10—Tokoroa A. and P. at Tokoroa.
February 13 and 14—Ohura A. P. H. and I. at Nihoniho.
February 15—Christchurch Stud Ram Fair at Christchurch.
February 16 and 17—Masterton A. and P. at Masterton.
February 16 and 17—Franklin A. and P. at Pukekohe.
February 16 and 17—Taumarunui and District A. and P. at Taumarunui.
February 17—Tauranga A. and P. at Tauranga.
February 17—Murchison A. and P. at Murchison.

* The Department of Agriculture exhibit will be staged at this show.

PACKING APPLES

APPLE packing requires considerable patience and skill and a great deal of practice. The many factors which contribute toward a neat, sound pack are outlined in this article by R. I. June, Orchard Instructor, Department of Agriculture, Hastings, which should be of assistance to those about to learn or to packers who are not satisfied with their present performances, as well as offering advice to growers and shed managers who are responsible for the production of well-packed cases.

WITH prospects of a greater export programme, special attention should be given to packing as protection for the fruit during the long journey and frequent handling. To land this commodity on overseas markets in the best possible condition is in growers' interests, and only if cases are packed properly can that aim be achieved.



[National Publicity Studios photo.

Importance of Correct Tuition

To the beginner tuition from an experienced packer is very important. Trying to learn by observation only is a great mistake, as a style that is slow, cumbersome, and very difficult to alter may be adopted. An incorrect style of apple wrapping can make the work slower, more difficult, and much more tiring, as many unnecessary movements may be made. The would-be packer should not try to gain speed until the wrapping and placing of the fruit has become a natural movement. Speed comes only with practice, and the beginner must not be impatient, as that will only retard his progress.

A packer usually picks up the paper with the right hand, passes the fruit with the left, and places it in the box with the right hand. If possible, a tutor and pupil should be either both left-handed or both right-handed; otherwise it is difficult for the pupil to follow the correct movements and for the teacher to pick his faults.

Types of Equipment

A packer should feel comfortable at his work and equipment should be adjusted to suit each person.

The height of the packing stand and paper holder is very important; an inch or two either too high or too low can make a good deal of difference to a day's output and to the strain on the packer. The bottom of the box should be at least 2ft. from the floor, making the top about 2ft. 11in. high. A tall person may require the bottom of the box to be 2ft. 2in. or even 2ft. 3in. from the floor; if the stand were any higher, the case would be too far above the bins and each fruit would have to be lifted before it could be passed across to the hand holding the paper, slowing down the packing operation considerably. If when the packer is standing upright the fingers will just touch the bottom of the case at the lower end, it is in a position which will cause least strain.

Having the bins reasonably high—about 36in.—to suit tall people is an advantage, because the floor can be built up to suit those who are not so tall. The tops of most machines are between 34 and 36in. from the floor.

The packing stand should be firm. The case should rest on it only at the ends, allowing the bottom to bulge as packing proceeds. The case should rest in a sloping position with the raised end 3 to 4in. higher and away from the packer.

The stand should be made so that the side of the case touches the bin when the case is in position. It should be made with a simple and quick adjustment to accommodate left- or right-handed packers. Stands on castors have the advantages that they may be placed according to the liking of the packer and rolled to the conveyer when the pack is completed, thus necessitating only a short lift to place the case on the conveyer leading to the nailing-down bench. Unfortunately this type is not suited to an uneven floor. Stands fitted to a slide on the side of the sizing machine should be well fitted to allow them to slide easily.

The rack or tray which holds the wrapping paper should be well made and firmly secured. Swivel-type racks built into the packing stand are most suitable, as they may be swung out of the way when the apple case is being moved or to let another person pass. Another type of rack often used clips on to the side of the case being packed, but it has some disadvantages: Its weight, especially when it is well filled with paper, tends to tip the case sideways, so that it has to be held with the body until the weight of the fruit placed in the case holds it firmly; in many cases the rack must be removed to allow other packers and workers to pass up the packing aisle; and a place has to be allowed for the rack while the full case is being removed. However, if this type of rack is used, it should be made so that the paper is level and not sloping at the same angle as the case being packed, otherwise the paper tends to slew around and becomes difficult to pick up.

To allow the paper to be picked up easily it is important that the needle point on the spring- or weight-loaded holder be sharp. It should be renewed at frequent intervals. When the needle becomes dull the paper will not tear away freely from the point and small pieces of paper tend to build up under the needle, making it difficult to pull the wraps free; then the needle must be lifted and the torn-out pieces removed at frequent intervals, thus slowing up the work and putting a strain on the hand. Correct spring tension to hold the paper firmly is also important. Suitable spring holders have not been available for some time, but are now on the market. However, a satisfactory fitting to hold a gramophone needle can be made quite easily.

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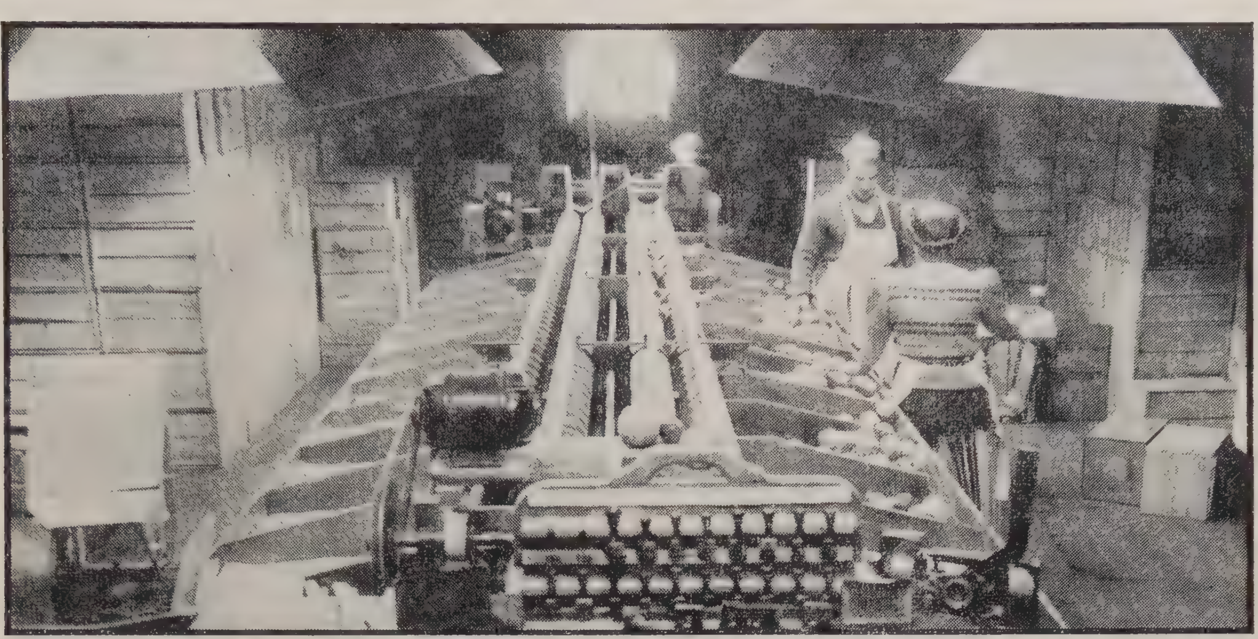


[*R. W. Orr photo.*

Where considerable night work is necessary, many growers have installed fluorescent lighting, which is a boon to sorters and packers alike. This photograph was taken without additional lighting.

Finger stalls are obtainable in two types—the thimble style, which covers the end of the finger, and the tubular type, which can be bought in lengths and cut to suit the packer. If the thimble type is used, care should be taken to obtain a stall of the correct size; if it is too large, it will not stay on, and if it is too small, it tends to retard the blood circulation and become uncomfortable. Tubular stalls allow the end of the finger to be exposed to the air and prevent perspiration. They are made in different sizes, but if the circumference is a little too large, a longer piece can be cut so that it grips the finger farther up and is held more securely. Finger stalls are usually worn on the second finger.

Shed Arrangement

Packing-shed owners or managers should give serious consideration to the layout of shed equipment. Empty cases should always be at hand, but arranged so as not to block out light. Liners and wrapping paper should be stored close to packers. There is usually room for a day's run under the conveyer or on top of certain types of grading machines.

Pencils, finger stalls, chalk, and first-aid outfits should have their proper places so they can always be obtained quickly. Packing counts above the bins are a guide to inexperienced packers, but should be checked when the variety is changed or if the machine is readjusted. Packing charts in convenient positions are also a help to beginners who have not memorised the counts.

Conveyers should be placed to reduce walking to a minimum. They should be of the wheel type rather than the roller type. The wheels run just inside the cleats at either end of the case and do not interfere with the bottom bulge, whereas the rollers rest along the whole bottom of the case, which disturbs the pack. The roller type is most suitable for cases after they have been nailed down, the cases being handled on their sides.

A wood floor is by far the most comfortable for packers and does not tire or chill the feet to the same extent as does a concrete floor. A board walk can be placed in the packing aisle if the floor is made of concrete, but the grading machine should be raised accordingly to obtain the desired height for packing comfort.

Lighting and Ventilation

Lighting and ventilation are not always given the attention they warrant. Packers must be comfortable as the work is tiring under the best of conditions. Skylights are essential, as both empty and packed cases must be stacked in a shed and often block light from windows.

Electric lights should be placed over the bins if possible. If it is necessary for them to be over the centre of the sizing machine, they should be placed high enough to prevent shadow from the machine or from material stacked on it from falling on the fruit in the bin. Where considerable night work is necessary, many growers have installed fluorescent lighting, which is a boon to sorters and packers alike.

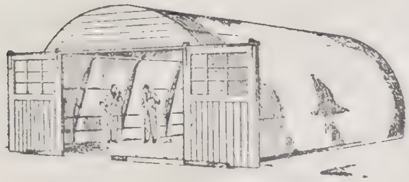
Though the workers sorting the fruit into grades and removing the rejects are responsible for the fruit that reaches the bins, packers should always remove undesirable fruit when they see it. Therefore they should acquaint themselves with the grading regulations; they are then in a position to advise the sorters if they consider the grade not up to requirements. The packer unconsciously glances at the next apple to be picked up while the hand is reaching for it. The size of the fruit is estimated in a fraction of a second and the choice of the next fruit to go in the case is made. At this time defects are often observed. They may be given closer observation when the fruit is being pulled down in the bin unless a rotary-bin type of machine is used.

Packing sheds should be well ventilated to ensure the comfort of workers as well as suitable conditions for stored fruit. Doors alone do not give sufficient ventilation at all times, as they often have to be closed on windy days. Side and roof ventilators should be installed to provide circulation of air without causing cold draughts on the packers. Nothing is more annoying to a packer than to have a draught lifting the wrapping paper and folding it over before the next sheet can be taken up.

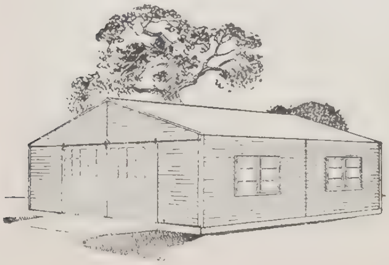
Wrapping Paper

Enough paper should be placed on the tray at a time to avoid time being lost in replenishing it at too frequent intervals. The glazed side should be uppermost. Some papers, particularly treated or printed lines, are likely to stick together, resulting in several sheets being picked up at one time; this tendency can be reduced by striking the block of paper sharply on the side of the bin or any other solid object before placing it on the tray, which tends to loosen any sheets that may be stuck together.

Wrapping paper is made in different sizes for different counts of apples. The correct sizes are set out in the table which follows. During the past few years the 8in. x 8in. paper has not been obtainable, so 9in. x 9in. wraps must be used on all small sizes in the meantime.



SIZES: 16ft. wide x 24ft., 30ft., 36ft., 42ft., 48ft., etc.



Sizes: 8ft. x 8ft., 8ft. x 16ft., 8ft. x 24ft., etc. 10ft. x 10ft., 10ft. x 20ft., 10ft. x 30ft., etc. 20ft. x 20ft., 20ft. x 30ft., 20ft. x 40ft. etc.

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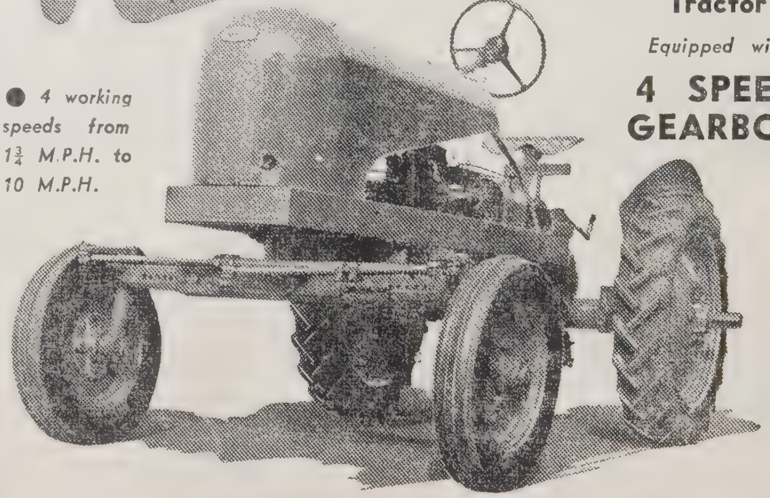

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Fruit count	Size of paper (inches)
96 and larger	11 x 11
100 to 138	10 x 10
150 to 180	10 x 10 or 9 x 9
198 to 216	9 x 9
234 to 252	9 x 9 or 8 x 8
270 and smaller	8 x 8

Packing Technique

Before the case to be packed is placed on the stand it should be examined to ensure that it is sound and free from protruding nails. Nails showing on the inside of a case may puncture the fruit, and that is the cause of many rots starting on fruit in storage. Nails protruding on the outside of the case are a source of danger to anyone handling the case after it has been packed. Growers can ill afford to lose experienced labour during the packing season through such injuries, which can be severe.

Placing the liner in the case is the next operation and one which requires care. It is essential to press the liner well down in the opening between the bottom and side of the case so that it lies flat over the full width of the bottom boards.

The ends of the liner are then folded over the top of the case and are held in place by the paper rack on one side and the bins on the other. Improper placing of the liner is a frequent cause of a pack being loose, because the fruit cannot be placed the full width of the bottom and prevents the bottom of the case from springing to form the necessary bulge. If the liner has a corrugated side, it is placed toward the case and away from the fruit.

The placing of the bottom layer of fruit is the most important. This layer is the foundation of the pack and requires careful placing to form evenly spaced pockets in which subsequent layers rest. Smaller apples should not be used at either end with the aim of obtaining a crown pack in this way. Small apples make smaller pockets, so using them in the first layer makes the pockets uneven and the whole pack faulty. Slightly smaller fruit can be used to advantage in the top two layers, and particularly in the last, provided the size complies with the tolerance allowed in the packing regulations, which is ¼in. of diameter.

Each apple should be placed with the calyx and stem toward the ends of the case. It is usual to pack with the calyx toward the packer, turning the last row so that the calyx rests against the end of the case. Some packers place stems toward them, but that depends on individual preference. However, the stem end should never touch the end of the case, as this may cause the skin to be broken, creating conditions for the entry of storage rots.

When about two-thirds of the first layer is in position the fruit should be pulled back gently toward the packer with both hands, consolidating the layer and making room for the last few apples. This pressure makes the central pockets slightly closer and the succeeding layers rest less deeply in them, thus raising the centre of the pack to help form the desirable bulge. If the fruit is pulled back too soon, tight pockets are formed at one end of the case and loose ones at the other, resulting in an uneven pack which works loose with handling. This is a common fault with beginners.

Downward pressure should be applied at both ends as packing proceeds, but not in the centre. This consolidates the pack and tends to force the ends lower so that the desirable crown is obtained without bruising the end fruits while the case is being nailed down.

When the apple is thrown into the hand holding the paper the fingers of that hand should close around it to assist the wrapping, but they should never be lifted off the apple while the other hand is completing the wrap. This is a common fault and one of the chief causes of overwork of sinews in the back of the hand. It is a mistake for beginners or even experienced packers to do too much wrapping of fruit during the first day or two. A full day's work to start the season often causes discomfort and loss of time through excessive wrist strain and the development of the complaint known as "packer's wrist", especially if large apples are being handled.

Marking Counts on Cases

Many systems of marking the packing count on the end of the case are in use. Where cases are labelled before being packed many growers fit rubber stamps above the bins so that packers can stamp the case in the correct place. Some prefer to mark the case liner with pencil or chalk, which obviates disfigurement of the case, but occasionally a case is nailed down by mistake before the stamping is done and the mark can no longer be seen. If the numbers are marked either where they will be covered when the case is labelled, or are placed neatly near the edge, the job is tidy.

The neatness of the finished case is often marred by large numbers chalked at random on the case end. Neatness of branding and labelling adds much to the attractiveness of a line of fruit and calls for no extra effort if done systematically.

Prevention of Bruising

Provided the pack is properly consolidated, with the ends lower than the centre, the top layer need not be more than 1½in. above the top of the case in the centre and slightly above at the ends. Certain counts vary considerably in firmness and height. For instance, the fruit of a 175 and a 180 pack do not differ greatly in diameter, but the pockets of the 175 pack are not deep, this size being the smallest packed 3-2. (The 175 pack is not usually suitable for long types of apples.) This type of pack has little give, so the case need not be as high. The 180 pack, on the other hand, is the first of the range of 3-3 packs and forms deep pockets. This case should be packed higher than the 175, as the fruit settles down more into the pockets under pressure of the lidding machine. If it were brought only up to the level of the 175 count, it would be slack after being handled.

Fruit should be handled carefully at all times. A great deal of damage can be done in pulling the fruit down in the bin where rotary bins are not used. The hands should be placed under the fruit as much as possible and the fruit pulled gently forward, using both hands in one motion. Bins should not be allowed to become too full and cause unnecessary pressure and bruising to fruit in the bottom. The packer should endeavour to pack this bottom fruit out occasionally. Broken stems and grit allowed to accumulate on the bottom of the bin can cause marking and skin punctures.

Fruit should be placed in the case firmly but carefully and without bruising it. If alternate layers are wrapped, no two unwrapped layers should touch. Top and bottom layers must always be wrapped, so in a 3-3 pack of six layers only two are left unwrapped, in a 2-2 pack of four layers three must be wrapped, and in the five layers of a 3-2 pack three layers must be wrapped and only two left bare.

Bruising may also be caused if new and used cases or thick- and thin-bottomed cases are mixed in the stack. Fruit sized to suit a new case with a thin bottom would be too high in a thick-bottomed case, which has little give; if the same-sized fruit was packed into a used case in which the bottom boards had retained their bulge, it would be too low when completed. Therefore cases should be sorted to ensure only one type being used over a period. Alteration of the sizing is usually necessary when changing from one type to another. New cases should be made up carefully, as slight alterations in the length of a case can make a considerable difference to the height of the pack.

Causes of Loose Packs

Several causes of loose or slack packs reaching the markets are common. Most of these have been mentioned already, and they may be summarised as follows:—

Failure to press down the ends of the layers of fruit as they are packed.

Faulty adjustment of sizing machines. The packer should always call this to the attention of the man in charge of the machine.

Failure to force the liner well into the corners between the sides and bottom so that fruit rests firmly against the padded sides of the case.

Fruit in the bottom layer forced back toward the packer before two-thirds of it is in position, thus causing the pack to be high at one end and low at the other.

The use of mixed thick- and thin-bottomed cases or new and used cases.

Lack of care in making cases to ensure uniform inside measurements.

Calyces and stems not facing the ends of the case and making the pockets even. Fruit so packed often twists round when the cases are handled, resulting in a loosening of the pack.

Careless handling, including excessive bumping or standing of cases on their ends.

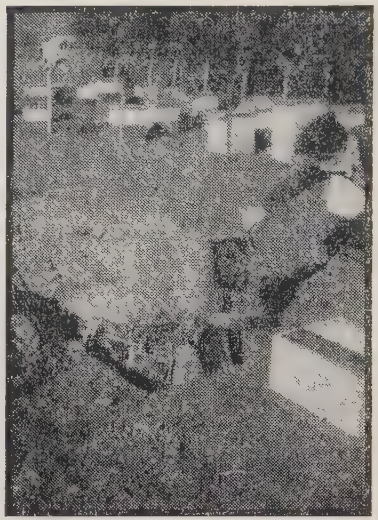
Further particulars of apple packing, including a chart of counts and sizes, may be obtained in Department of Agriculture Bulletin No. 253, "Harvesting and Packing the Apple and Pear Crop for the Home Market."

◆

Dealing with American Foul-brood

Seasonal Notes for the Domestic Beekeeper

A HEALTHY honey bee population spread over pasture lands and fruit-growing and seed-producing areas is most important to New Zealand's economy. It can be achieved by careful breeding of desirable bee stocks and correct methods of apiary management, including strict measures in dealing with any colonies infected with disease. This article by the Horticulture Division discusses the eradication of American foul-brood.



A large hole 18in. deep allows ample ventilation around the fire started in the bottom of a pit in which diseased bees and combs are burnt.

AS the careful beekeeper cannot take precautions against a careless neighbour who neglects his bees, the State gives him legal protection. Unfortunately honey bees are subject to a number of diseases and pests including those which attack the brood and those which affect the adult bee. However, American foul-brood (*Bacillus larvae*), which was introduced into New Zealand with imported bees many years ago, is the most serious disease of bees in New Zealand.

Until recently beekeepers have been allowed to treat infected colonies under certain circumstances, but experience has shown conclusively that the shaking method of treatment to save infected colonies has been unsuccessful in eradicating the trouble.

In future beekeepers will be required to destroy the contents of diseased hives found by Apiary Inspectors and to sterilise thoroughly any remaining hive equipment by approved methods.

It is not considered necessary to burn good apiary equipment such as hive boxes, lids, and floor boards provided they are sterilised thoroughly.

Eradication of Foul-brood

The measures that are necessary to eradicate foul-brood are set out here for the guidance of beekeepers, who should make periodical inspection of their hives during the breeding season and deal promptly with any brood troubles found.

Destruction of Diseased Bees

The safest time of the day to destroy diseased hives of bees is in the late evening or during wet weather when there is no likelihood of bees flying during the day. The most common method of killing bees preparatory to burning hives is to gas them with calcium cyanide. One or 2 tablespoons of the powder should be scattered inside the hive on the floor board or spread quickly on a piece of damp cardboard and pushed into the hive entrance. The beekeeper must stand on the windward side and should not allow the powder to come in contact with his fingers or body.

Another method is to lift the hive cover, drop the powder between the combs, and replace the cover immediately. In a very short time the bees will all be dead.

Calcium cyanide is a deadly poison and is used at the operator's own risk. Distributors of the chemical supply full directions for its use under all circumstances with each package. These directions should be read carefully and followed meticulously.

An alternative method is to block the hive entrance carefully after making certain that the hive is otherwise bee-tight, raise the hive lid, and pour petrol (1 or 2 cups according to the size of the hive) inside over the bees and combs. The hive should be left closed and undisturbed until the vaporised petrol has killed the bees. Care should be taken when the material to be burnt is ignited, as the fumes will create a small explosion.

Burning Diseased Bees and Combs

The first step in burning diseased hives is to dig a hole about 3ft. or more in diameter (according to the amount of material to be dealt with) and 1ft. to 2ft. deep close to the affected hives. Part of the hole should be made deep enough to take any liquid honey that may escape the fire and to allow the honey to be buried finally well below digging or ploughing level. Two iron bars, old pipes, or heavy timber placed across the top of the hole are helpful in keeping the fire from collapsing and allowing any honey that escapes to run away without choking the fire.

Place a liberal amount of dry twigs or any fine, dry wood in and above the hole to give the fire a good start. Carry the diseased hives to the pit, taking care not to spill any of the contents on the ground. If a hole (approximately 18in. deep) is made large enough to allow ample ventilation the fire may be started on the bottom of the hole at one end as illustrated. The dead bees should be shaken on to the stack together with the hive mats and any worthless woodwork.

The fire should then be started and frames free of honey stacked in the centre, as they will burn easily. When the fire has a good hold add additional combs containing any brood and honey around the edges of the fire, which should be kept well ventilated, and allow any melting material to run to the deepest part of the pit.

When all the material is burnt the surface of the ground around the pit to a depth of 1 or 2in. should be removed with a spade and thrown into the pit to avoid the danger of leaving any dead bees or other infected material accidentally dropped while burning the frames and combs. The pit should then be refilled with earth, and all salvaged hive equipment removed immediately to a safe place for sterilising.

Disinfection of Hive Parts and Appliances

All salvaged material taken from diseased colonies should be sterilised as soon as possible after the destruction of the bees and combs. Any brace combs or propolis and refuse from bottom boards should be scraped off and carefully collected and burnt.

Metal rabbets attached to the hive boxes should be removed and sterilised or burnt.

The interior surfaces of hive boxes, lids, and bottom boards should be scorched with a painter's blowlamp. Scorching should be thorough but not to the extent of charring the woodwork. Special care should be taken to see that all cracks and corners are scorched by the flame, as otherwise the treatment may not be successful.

Boiling Equipment in Wood Oil

Wood oil is a light oil with a low boiling point. If heated to the stage at which vapour begins to come off, it will be at a temperature of approximately 212 degrees F. At this temperature it can be used to sterilise equipment, which should be immersed in it for a minimum of 15 minutes. Where oils are used it is preferable that operations should be performed outside and care should be taken to select a container which will allow plenty of room for the expansion of the oil when heated, so that it will not spill and be ignited by the fire.

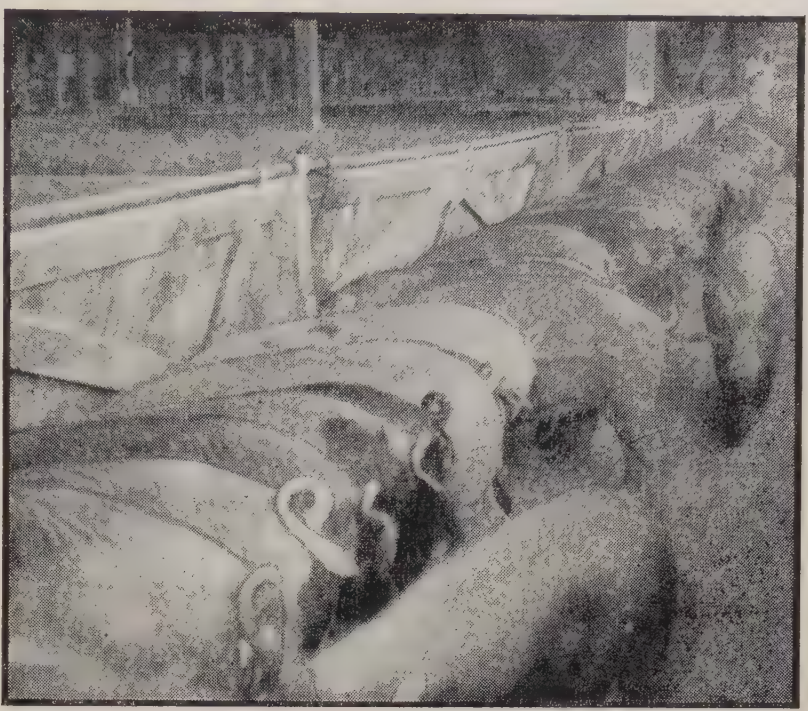
Boiling equipment in paraffin wax is effective, but is tricky. Details of this method may be obtained from Apiary Instructors.

Queen excluders and feeders which cannot be treated with a blowlamp should be boiled for 15 minutes in a caustic soda solution (½lb. of caustic soda to 10 gallons of water), but the operator should take care not to get the solution on his face or hands. Where there is no beeswax or propolis adhering to the equipment a weaker solution (4oz. of caustic soda to 10 gallons of water) should be used.

If a hive tool has been used in the operations, it should be well sterilised by fire before being used again.

Country Slaughterhouse Piggeries

AT most country slaughterhouses pigs are kept for the purpose of disposing profitably of the offal from the slaughterhouse and of providing a supply of fresh pork for the retail business. In this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, and J. Wheeler, Supervisor, Northland District Pig Council, describe an efficient layout for this purpose and deal with the general management of the piggery.



[*Cinestyle Photo Service photo.*

AS usually more pigs are produced than are needed for supplying pork for the shop, the balance are taken up to bacon weight and disposed of through the usual channels. In fact, the piggery at a country slaughterhouse occupies much the same place in the economy of the business as it does on a dairy farm; the pigs turn what otherwise would be a waste product into a saleable commodity. As on the dairy farm the more efficient the layout of the piggery and necessary facilities the easier, more pleasant, and more profitable is the running of the piggery.

A great difference between dairy farm and country slaughterhouse piggeries is that while the supply of food on the former, skimmed milk or whey, is seasonal that at the latter is steady all the year. This is a considerable advantage, especially as it is not at all easy to breed and rear suckling pigs on a diet of offal unless some other form of food supply is available also. As a result the usual practice is to buy the pigs as slips, and because of the regular supply of food this can be done when the market is favourable.

The planning and design of what is usually called the boiling-down department and the piggery make all the difference to the ease with which they can be operated. Unfortunately, in many cases arrangements are very crude.

Faulty Procedure

Frequently the procedure is on the following lines:—

After the inedible offal has been washed the surplus fat is trimmed off. (This is important, as the minimum of fat should be fed to pigs; and there will always be plenty left for them; and the fat can be rendered down into tallow, for which prices are good.) The offal is carted in a wheelbarrow to a copper, or coppers, which usually are of steel. It is placed in the container and a few buckets of water are added. The copper is covered with wet sacks, the fire is lit, and the contents left to cook for 3 or 4 hours. (Under the Meat Act it is compulsory for all slaughterhouse offal and butcher's shop waste to be cooked by boiling for at least 2 hours before being fed to pigs.)

Slaughtering is done early in the morning, the slaughterhouse is cleaned up, and the offal is cooked. It is fed out the following day.

When coppers are used it is not uncommon for them to boil over, either because they are too full or the fire is too fierce. This makes a most unpleasant mess which is very difficult to clean up properly. The contents may also get burnt owing to the copper boiling dry. If burnt offal is fed, it may cause trouble among the pigs, as does improperly cooked offal; it brings on scouring and retching and generally gives pigs a setback.

The contents of the copper have to be baled out and taken to the piggery for feeding, which again is unpleasant work.

Another drawback to this system is the difficulty of disposing of the blood. It cannot be cooked satisfactorily in

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Country slaughterhouse piggery layout. In the foreground is the boiler house with store shed and shed for hides and pelts attached; in the background is the piggery and bone storage area.

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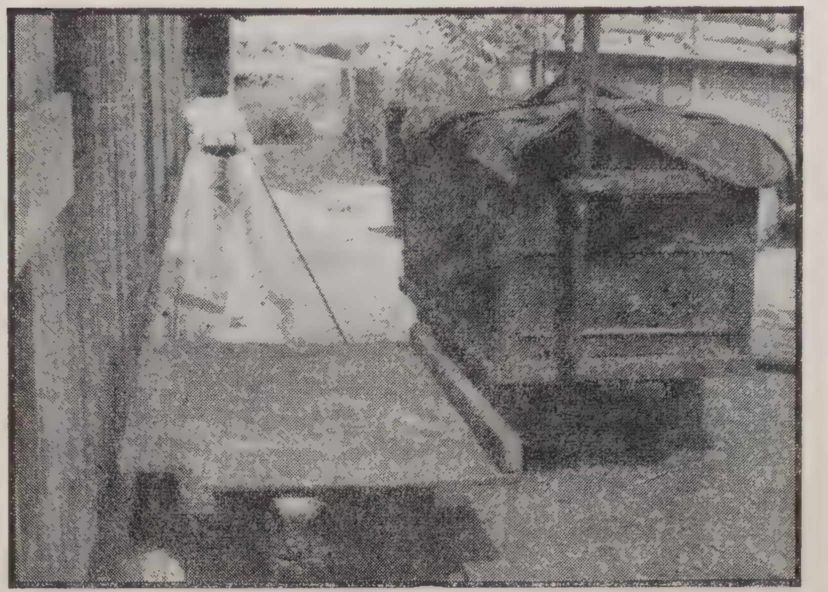
coppers because of the likelihood of it burning and the great difficulty of diluting it sufficiently with water. If it is run into a drain or creek, most unpleasant pollution is caused; if it is carted away and spread over a paddock the grass becomes burnt and attract flies. To dig or plough it in involves extra expense and work.

Recommended Method

The method briefly described generally proves both messy and laborious. However, the job can be done in an infinitely easier, cleaner, and more satisfactory manner if cooking is done by steam and the layout is well planned. It is an advantage if a site can be chosen on which the ground slopes from the slaughterhouse to the boiling-down plant and the piggery. All the blood, washing water, and inedible offal should be run from the slaughterhouse floor into a wooden or steel container mounted on a trolley which has pneumatic tyres or is on rails. The trolley runs to the boiling-down plant and then on to the piggery. All cooking is done by steam in the container and all feeding out is done from it, thus reducing considerably the amount of handling.

Size of Container

The container should be 5ft. x 2ft. x 2ft. This size will hold all the offal and blood from 3 cattle beasts and 10 sheep and is sufficient for the average country slaughterhouse. The dimensions specified for the tank keep its over-all height when on the trolley as low as possible so that material from the slaughterhouse floor can be run into the tank conveniently. On a level site it will be necessary to build up the level of the slaughterhouse floor slightly or to have an excavation into which the truck can run. In the latter case some mechanical assistance may be necessary to pull the truck up the slope to level ground. These details will depend entirely on local conditions; if the slaughterhouse is higher than the boiling-down plant and piggery, no difficulty will be experienced.



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Cooking tank (right). It has been moved by means of skids from the trolley (left) on to a stand. Note that the delivery pipe used during feeding is held vertical while the offal is being cooked.

The trolley should be of a sufficient size to carry the cooking tank and a container for the surplus fat and shop waste, which must be kept separate from the rest of the offal.

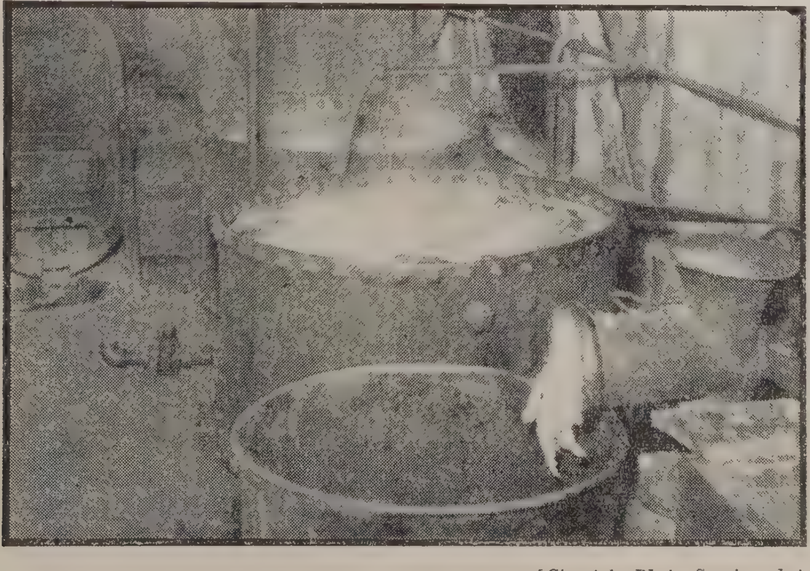
The equipment at the boiling-down plant should consist of a small steam boiler and two steam-jacketed pans in which the tallow can be rendered down. Small steam boilers of the type required are readily obtainable, and either wood, coal, or oil fuel can be used for firing according to convenience of supply. Any local engineering firm can supply the steam-jacketed pans. This equipment should be housed in a good building with a concrete floor, concrete walls, at least to a height of 3ft., proper drainage, and a good water supply.

A steam pipe from the boiler should be brought through the wall and fitted with a suitable coupling so that a steam pipe can be inserted in the cooking tank on the trolley, almost to the bottom of it. The tank should be covered with wet sacks supported on battens. The contents should be brought to the boil and kept boiling for 3 to 4 hours. An even temperature is maintained throughout the period of cooking and all risk of either boiling over or burning is eliminated. Because there is the washing-down water as well as the blood and offal in the cooking tank, it is not necessary to add water.

Advantages

The cost of installing the boiler and pans is no greater than that of building coppers of sufficient size, and in cleanliness, ease of working, and saving of labour the former arrangement has tremendous advantages. The amount of fuel required is about half that necessary to do the same amount of cooking in coppers and the cooking is always uniform which is of great benefit to the pigs. Blood ceases to be a problem and, in fact, becomes an asset, as it is turned into good pig food.

To feed the pigs the tank on the trolley, which, when cooking is completed, will contain approximately 80 gallons of soup and from 150 to 200lb. of solids (from the 3 beasts and 10 sheep), is taken down a track to the piggery. The track is a tramline, if the trolley has iron wheels, or a concrete path, if pneumatic tyres are used. The piggery should be designed so that the troughs are along the front of the house. To facilitate feeding there



[*Cinestyle Photo Service photo.*

Stem-jacketed pans for rendering tallow. All shop scraps, except bones, are put through the mincer in the foreground before being put in the pans.

should be a 2in. opening at one end of the tank fitted with an elbow to which is attached a sufficient length of 2in. pipe to reach from the tank to the troughs. This pipe should be held vertical by a clip on the tank while filling and cooking are in progress and should be pushed down into the troughs to feed the pigs with soup. Solids should be removed from the tank to the troughs with a shovel; this is virtually the only handling that has to be done.

When empty the tank should be taken back to the boiling-down plant and washed thoroughly with a steam hose from the boiler. It will then be ready to be filled again. The provision of two cooking tanks that can be used alternately is a great convenience, as it enables the food to be spread over more feeds without removing it to another container. The quantity of food mentioned earlier is sufficient for 100 store pigs. Only a few minutes are required to feed the pigs.

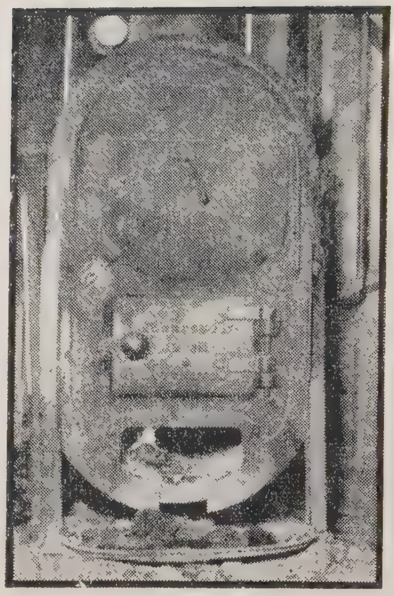
Drinking Water and Grazing

Fresh drinking water must always be available to the pigs and a special water trough with a continuous supply of water should be provided in each pen. This is of the greatest importance for pigs fed on offal.

Access to good grass pasture is also essential and the paddocks must be of sufficient size to avoid their becoming pugged up. The pigs should all be ringed to prevent them rooting. More than one paddock should be provided so that rotational grazing can be carried out. Pasture must be maintained in good leafy condition and the best way of doing this is by controlling it with sheep. As it is always necessary to hold sheep for a few days in the vicinity of slaughterhouses, this does not present any difficulty. The paddocks should be harrowed and top-dressed according to local practice. Pasture is important in balancing the rations of pigs and it should always be available to them.

Disposal of Bones

A concrete bin into which all bones can be put after the pigs have picked them clean should be provided. In some cases the bones are burnt as fuel, but this is not really economic, as they have a considerable market value; if one cattle beast is killed per week, 1 ton of bones per year will be produced. Both cattle and sheep trotters and all pieces of wool should be burnt. Trotters have no value as feed, and wool and hair many cause trouble among the pigs.



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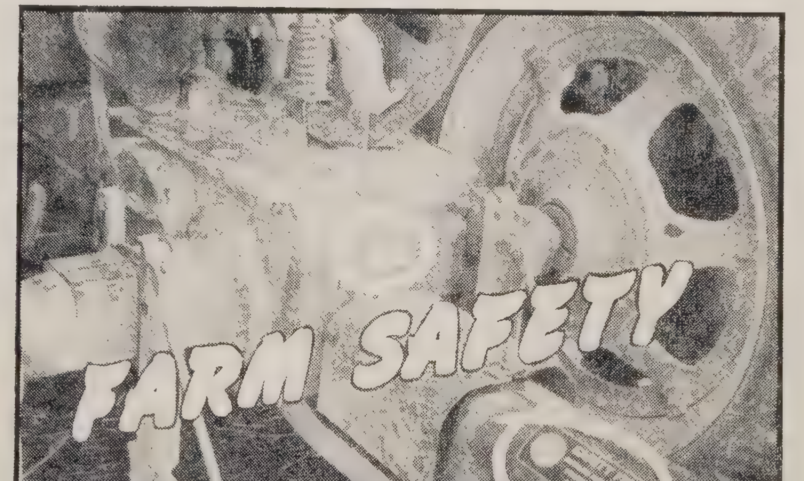
Small boiler used for generating steam; such boilers are very economical in the use of fuel.

As under present conditions killing in slaughterhouses takes place on only 5 days of the week, it means that on 2 days there will be no offal. There will be some shop waste, which is, of course, fed to the pigs after the tallow from it has been rendered, but because the shop waste is not sufficient to feed all the pigs for 2 days, some supplementary food has to be used. If 2½ buckets of barley are added to the shop waste in the tank and the whole cooked with sufficient water to bring it up to the usual quantity, enough food will be provided. As this barley is used only once a week, the cost of feeding it per pig produced is very low and its effect in assisting to balance the ration is most valuable.

No bones or offal that have gone bad or fermented should ever be cooked or fed to pigs. The least result is to give them a serious digestive upset, and losses can occur from this cause. Bones or offal which go bad should be burnt. Burying them is unsatisfactory as no matter how deeply they are placed it encourages vermin.

Buildings

No details of the design of buildings have been dealt with in this article, as they are dependent to a great extent on the site and personal preference. The shed housing the boiler should be of ample size for easy working, and a store shed for feed and a rat-proof store for meal, barley, etc. should be provided. The water supply and drainage must be good. A layout such as has been recommended can be operated very easily and kept in good order, when it is never offensive. Pig production on offal is very profitable and if carried out under good conditions in a well-designed layout has none of the unpleasant features that only too often are associated with it.



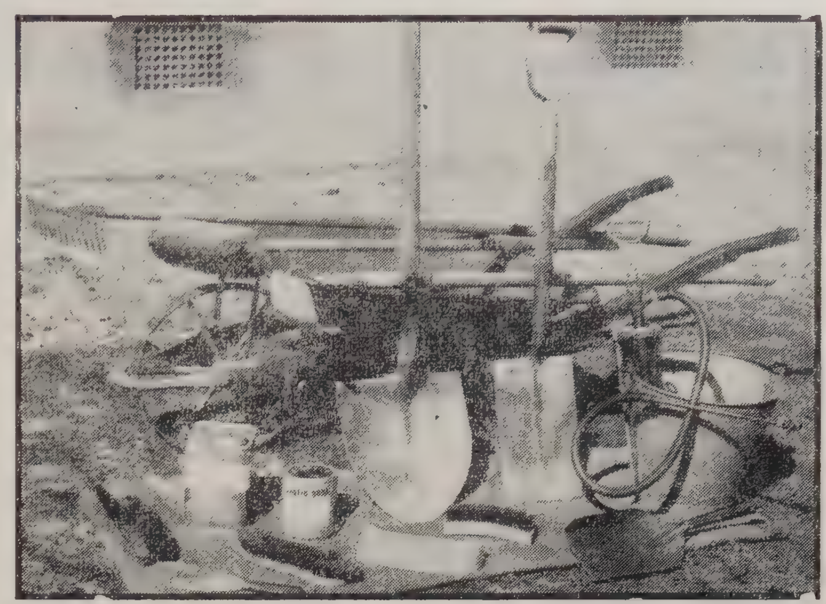
WITH the haymaking season under way and the time of grain and seed harvests drawing near, most of New Zealand's 22,000 tractors will be in action during the next month or so, many of them drawing machines driven by power take-off. With such machines it is essential that the power take-off guards be in place while they are operating, and just as essential that the power take-off be out of gear before the driver dismounts from the tractor. Neglect of either of these two precautions leads to a succession of accidents each year, many of them resulting in injury and some in death.

Power take-off shields are placed on machinery solely for the protection of the operator. Keeping them in position prevents what may be serious injuries.

—*C. J. CROSBIE, Farm Machinery Instructor,*
Department of Agriculture, Christchurch.

The Annual Clean-up in the Household Poultry Pen

THE suggestion that an annual clean-up be embarked on does not imply that poultry housing should be cleaned out only once yearly, but the holiday period, now at hand for a large section of the community, provides an opportunity for a thorough and special effort to bring everything about the poultry run into the best of order. The beginning of the new year is a little early for the annual clean-up, which could be left with advantage until February or March, but it is better done now than neglected altogether. In this month's article for the household poultry keeper W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton, explains points that should not be overlooked and why the clean-up should be done preferably in a few weeks' time.



[Fraser Niederer photo.

Neither tools nor labour should be spared in a thorough annual clean-up of the poultry house and its perches, nests, and equipment.

[Fraser Niederer photo.

Exterior and interior walls of concrete poultry housing can be whitewashed, but creosote is better for wooden walls. Both the whitewash and the creosote can be applied with a brush or a spray pump. Though creosote makes woodwork dark and reduces light outside the house, the poultry keeper has few better allies and none cheaper.

A POULTRY laying house and its equipment need frequent cleaning. Troughs, feeders, and drinkers require constant attention, all sorts of unwanted items tend to accumulate, bones and unpalatable scraps from the household table are left lying about the pen or the run, and if more than a sufficiency of greens is fed, cabbage stalks and leaf stems are left. All these things should be tidied from time to time.

Accumulated arrears of such work can receive attention during the holiday period. Untidiness is at least an eyesore, and certain aspects of it can increase the likelihood of disease outbreaks. Surplus table scraps, bones, and vegetable stalks encourage rats.

January is not the best time of the year for the annual clean-up, but an early reminder may be useful, and the work is better done early than not at all. However, a better time is just before this season's pullets reach maturity and are to be transferred to the laying house. Everything would then be made sweet and clean in readiness for them. When pullets are ready for this transfer varies with the date of hatching and their growth: Early-hatched chicks should be reddening in January, August-hatched birds will be ready for transfer any week, September hatches will mature in February-March, and late chicks will not redden up until April, May, or even June. The best periods during which to have light-breed chickens hatched are: In the northern parts of the North Island, the middle to the end of August; in the southern portion, early to mid-September; and in the South Island, the second and third weeks of September. For heavy breeds the best times are a month earlier. Chickens hatched at these times are likely to give the best laying results throughout the year and should not winter moult. Of course, hatcheries cannot cope with all the demands for chicks hatched at these periods, so buyers are well advised to place orders well ahead.

Cleaning Equipment

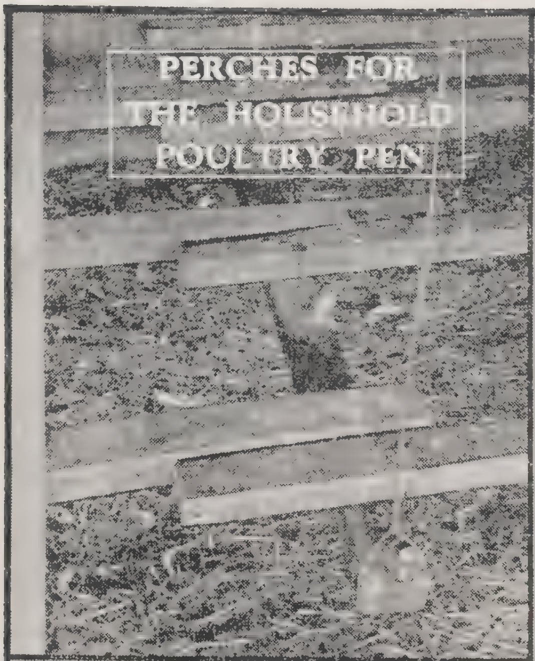
Perches, droppings boards, nests, and hoppers should be built so that they can be dismantled. Carefully scrape these items, other equipment, and the walls and framework so that they are clean of organic matter. Then scrub the equipment well, preferably with a caustic soda solution, keeping it away from contact with the skin. A hand pump can be used to clean down the walls.

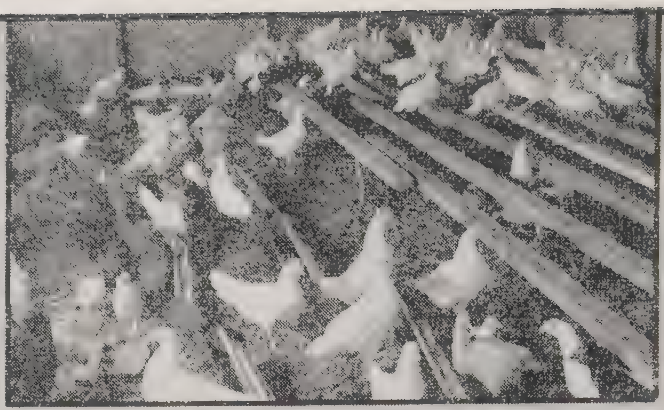
Litter, Floor, and Walls

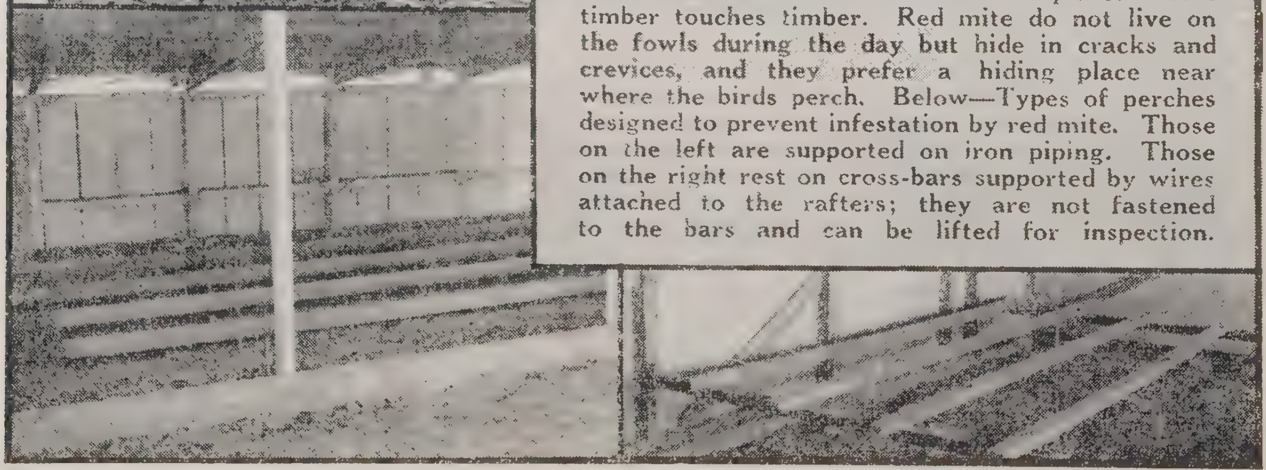
The walls cannot be sprayed until attention has been given to the floor and litter. The action required varies with both the type of flooring and the kind of litter. If the litter is dirty, damp, caked, or shallow, it must be cleaned out altogether. If it is deep and loose, only a portion or perhaps none may need to be removed. Later, the litter removed should be replaced in part and, as it is broken down by the birds, more added from time to time until the depth is sufficient.

If the flooring is of concrete or wood, the spray running down the walls quickly accumulates in pools, so a decision has to be made whether the litter can be piled up to one side or must be shifted out of the house temporarily. Poultry-house floors should have a slight slope to drain off water. An earth floor requires digging to an adequate depth before spraying can be done; even then a drying-out period is necessary.

PERCHES FOR THE HOUSEHOLD POULTRY PEN







Above—If the birds require six rows of perches, the housing is overcrowded. This illustration shows how pullets should not be kept. Apart from the obvious overcrowding and the excessive number of perches, breeds are mixed, cockerels are being reared with pullets, and the floor is cluttered with troughs and other equipment. Left—The use of short lengths of perch should be avoided to reduce the number of places where timber touches timber. Red mite do not live on the fowls during the day but hide in cracks and crevices, and they prefer a hiding place near where the birds perch. Below—Types of perches designed to prevent infestation by red mite. Those on the left are supported on iron piping. Those on the right rest on cross-bars supported by wires attached to the rafters; they are not fastened to the bars and can be lifted for inspection.

[*Fraser Niederer photos.*

Litter need not be discarded merely because it is old, for the bacteria in an old, but dry, loose litter are excellent friends. A loose litter 6in. deep or more is desirable.

Pay special attention to cracks, crevices, knot-holes, and any place where timber is nailed to timber. Ensure that the caustic water seeps into these places.

Painting

When all the equipment and walls are dry a decision must be made whether the house is to be painted with creosote, whitewash, or both.

Creosote makes everything dark in colour and reduces the reflection of light from the walls, but that is not serious. Even if whitewash is used for the upper walls and roof, it is advisable to creosote the lower walls, droppings boards, perches, and nests. Creosote can be put on with a brush or a spray pump. If it is too thick, add a little kerosene; used car-sump oil may also be added. As the fumes from creosote are very strong, this work should be done early in the day if laying fowls are to go back in the shed that night, or they may be put off the lay.

Creosote is also a good preservative for the exterior timber, but a poultry house looks much neater if it is well painted. Paint left from another job may be available, and the little extra expense is well worth while.

Repairs

The holiday period provides an opportunity to effect repairs and even major alterations which will enable more efficient management. Taking a pride in the fowls and their housing leads to their becoming an asset which adds to the value of the property.

Perches, droppings boards, and nests should be built to counteract red mite and, as far as possible, body lice. The method of building this equipment was described in last month's article.

The Run

Attention to the run should include removing rubbish, replacing fence posts which have deteriorated, repairing broken wire netting, and re-straining slack wires. If the run is bare of vegetation, dig it over. Deep digging is not essential—in fact, frequent shallow digging is better than one deep digging. Keep stirring up the lower soil so that sunshine can work on fresh surfaces.

The run should not be depended on to supply enough greenfeed for the birds. The fowls soon scratch bare an average-sized run and the growth is not sufficient for their needs. If they do not get ahead of the growth in a larger run, the surplus greens become rank and coarse, then having little, if any, value to the hens. Growing special greens for the birds and feeding some daily ensure good yolk colour and increase the egg yield far more than many poultry keepers believe.

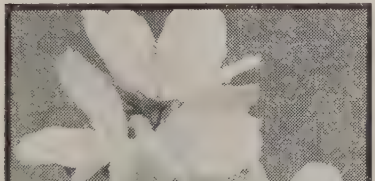
Summer Pruning of Shrubs in the Flower Garden

THOUGH most hardy trees and shrubs grown in New Zealand for ornament do not require regular pruning, almost all of them require cutting at some time to improve their shape, to make them more healthy, or to increase their flowering capacity and general usefulness. In this month's article for the flower gardener C. K. Ellis, Horticulturist, Department of Agriculture, Dunedin, gives advice about the pruning of shrubs which flower in spring and early summer on wood matured from the previous season's growth.

PRUNING of trees and shrubs can be divided roughly into two types: The cutting back and thinning of trees and shrubs which have flowered on matured wood produced during the previous season, and the cutting back of plants which produce their flowers on the tips of shoots of the current season's growth. The article deals only with the first type, which is known as summer pruning.

[*Douglas Elliott photo.*

Genista species and varieties such as this bush of *G. sagittalis*, become unsightly if they are not pruned regularly, but they can be killed by incorrect pruning. The correct method is described below.



[*Douglas Elliott photo.*

The dwarf mock oranges (*Philadelphus*) benefit considerably from severe annual pruning.

The most satisfactory guide to the time of pruning is the time of flowering. Spring-flowering and early summer-flowering shrubs should be pruned as soon as the flowers fade. The *Diervilla* species (weigelias), for instance, will live for a considerable number of years if left unpruned, but their flowering qualities are not nearly as good as those of shrubs pruned regularly and correctly. Immediately after they have flowered the old flowered shoots should be cut back to a point where strong, new shoots are being produced. The shrubs will not be as long lived when this procedure is adopted, but a brilliant floral display for fewer years is preferable to a mediocre one for many years.

Jasminum nudiflorum (winter jasmine) is improved greatly by having its flowering shoots cut back to within two or three buds of their bases immediately flowering has ceased. No cutting must be done on this species after growth has begun for the new season.

Syringa species (lilacs) and varieties which do not produce flowers freely are often invigorated by the removal of all suckers from the base, the removal of all weak growths, and the severe thinning of inside shoots during January. Such thinning need be done only every two years or so, but suckers and weak growths should be removed each year.

Philadelphus hybrids and their varieties (dwarf mock oranges) of the types similar to *P. lemoinei* benefit considerably from severe annual pruning. At the end of the flowering period the flowered branches should be cut back to where vigorous new shoots are growing. Such pruning produces much longer flowering shoots than when the bushes are left unpruned. The strong-growing *Philadelphus* species need only an occasional thinning, severe pruning being unnecessary.

The species and varieties of the genera *Cytisus* and *Genista* have a somewhat unusual reaction to pruning. Should they be allowed to grow unpruned for several years and then be cut hard back into the old wood. invariably they suffer greatly, and usually they die. If they are not pruned regularly, they soon become straggly and rather unsightly. Immediately the flowers fade the shoots should be cut back, but never beyond the bases of the shoots produced during the previous season's growth or sections of the bushes are likely to be killed.

The following list, though far from complete, may serve as a guide to home gardeners. All the plants mentioned are early-flowering species or varieties and may be pruned immediately the flowers have faded, but the best pruning time for some of the shrubs listed will have passed by January.

Acanthopanax pentaphyllum (five-fingered aralia).

Acer rubrum (red maple) and *A. saccharinum* (sugar maple): The maples should be pruned only when in full leaf. If they are cut during spring or autumn, the sap flows very freely, to the detriment of the trees.

Amelanchier canadensis, A. sanguinea, and *A. oblongifolia*: Pruning the *Amelanchier* species is not necessary every year, occasional pruning to retain shape being sufficient.

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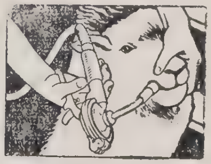

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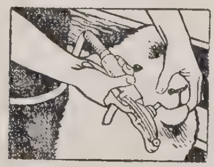

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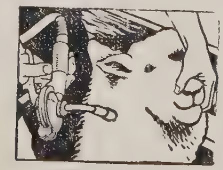

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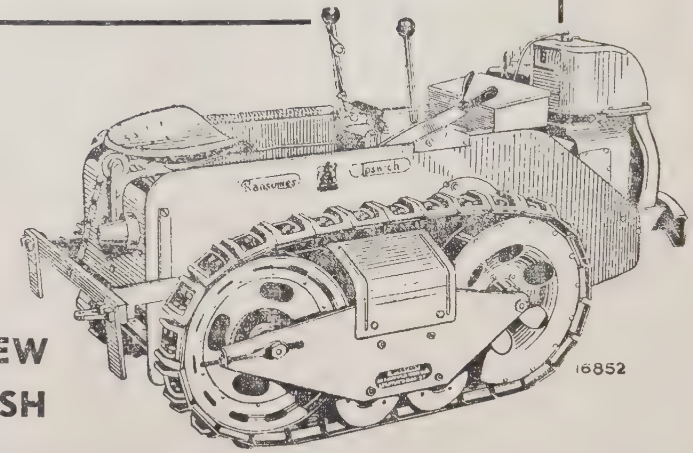

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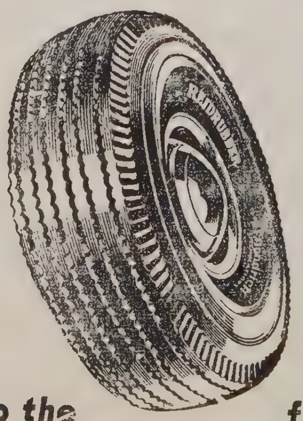

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Ampelopsis heterophylla: Regular pruning is not necessary unless space is restricted, in which case the young growths should be shortened well back once or twice during summer. Further pruning is necessary in winter.

Arctostaphylos manzanita and *A. uva-ursi* (bearberry): Shaping and cutting out of weak growth every second year is all that is necessary.

Berberis dictyophylla, B. thunbergi (Japanese barberry), *B. vulgaris* (common barberry), *B. darwini*, and *B. stenophylla*: Hedges of *Berberis darwini* should be clipped hard immediately after they have flowered and should not be cut again until after the next flowering.

Calycanthus fertilis (Carolina allspice): Pruning in alternate years is sufficient.

Caragana arborescens (pea tree) and *C. pygmaea*: Regular pruning is necessary only in the young stages. Once shapely bushes are obtained occasional cutting is sufficient.

Cercis siliquastrum (Judas tree): Pruning is necessary while the plants are young, but once they have grown into a good shape only the removal of dead and surplus wood is necessary.

Chaenomeles (Cydonia) japonica (Japanese quince) and *C. maulei*: When these shrubs are grown as bushes pruning them regularly is not necessary, but when they are grown against walls or trellises they should be pruned back to near the main stems as soon as the flowers fade.

Chimonanthus fragrans (winter sweet): Only occasional pruning to retain good shape is necessary. More flowers are produced if the bushes are left unpruned for several years.

[*Douglas Elliott photo.*

***Berberis darwini*, an evergreen species, bears orange-yellow or red flowers, followed by plum-coloured berries.**

[*Douglas Elliott photo.*

***Amelanchier oblongifolia* is a hardy deciduous shrub which bears white flowers in spring and tinted foliage in autumn.**

Chionanthus virginica (fringe tree).

Cladrastis lutea (yellow-wood): Annual pruning is not necessary.

Clematis montana and varieties and *C. alpina*: These two species and several other early-flowering types should not be pruned until after they have flowered. All late summer-flowering and autumn-flowering types are pruned in the normal way during winter.

Cotoneaster adpressa, C. horizontalis, C. racemiflora, and C. tomentosa: The *Cotoneaster* species listed need pruning only every 2 or 3 years.

Crataegus coccinea, C. phaenopyrum (Washington thorn), *C. crus-galli* (cockspur thorn), *C. oxyacantha* (hawthorn), and *C. punctata.*

Daphne ceneorum, D. mezereum, and *D. mezereum* var. *alba*: Pruning *Daphne* species every year is not necessary.

Deutzia gracilis: Gradual renewal by thinning out crowded stems is the best practice. Old flowers and dead and injured wood should be removed regularly.

Elaeagnus angustifolius and *E. multiflora*: These are improved if the longest shoots are shortened during summer.

Enkianthus perulatus: This species need not be pruned every year.

Erica carnea and *E. carnea* var. *alba*: Little more than the removal of flower heads is necessary.

Euonymus alatus and *E. europaeus* (spindle tree): Only sufficient pruning to keep the bushes shapely is required.

SUMMER PRUNING OF SHRUBS

[*Douglas Elliott photo.*

Cercis siliquastrum **(the Judas tree) is a hardy deciduous tree which bears rosy lilac flowers.**

Exochorda grandiflora (pearl bush).

Forsythia intermedia and *F. intermedia* var. *spectabilis*: Should this species and its variety be pruned severely, few flowers will be produced the following spring, but if the growths produced are left unpruned, a magnificent display is obtained a year later.

Halesia carolina: Occasional thinning only is necessary.

Hamamelis mollis (Chinese witch hazel).

Kalmia latifolia.

Kerria japonica: As much as possible of the old wood should be pruned out as soon as the flowers fade.

Leucothoe catesbaei: Thinning of overcrowded shoots is sufficient.

Magnolia denudata, M. lennei, M. soulangeana, and *M. stellata*: Pruning magnolias regularly is not necessary, but any thinning needed should be done after they have flowered. If possible, cutting out large limbs should be avoided.

Paeonia suffruticosa (tree peony): Little more than the removal of dead tips is necessary.

Pieris floribunda, P. japonica, and *P. taiwanensis*: Little more than the removal of dead flower heads is necessary.

Prunus maritima (beach plum), *P. subhirtella* var. *pendula* (weeping Japanese cherry), *P. persica* var. *flore albo-plena* and *rubris* (double white and red peach), and *P. serrulata*: Prune flowered shoots back to within three or four buds from the base.

Rhodotypos kerrioides (white kerria): Annual pruning is not necessary.

Ribes alpinum (mountain currant), and *R. aureum* (flowering or Missouri currant).

Sorbus americana (American mountain ash) and *S. aucuparia* (European mountain ash): Only thinning and shaping are necessary.

Stephanandra tanakae: Remove dead wood after growth has started. Parts of this species are almost invariably killed during winter in colder districts.

Styrax japonicum.

Wistaria sinensis and *W. sinensis* var. *alba*: Shorten young shoots back to within five or six buds from their bases in January. Further shortening will be necessary during winter, for the aim is to produce short, spur-like growths.

Flower Garden Work for January

Biennial plants such as wallflowers, sweet williams, and myosotis may be raised from seed sown during January in partly shaded places in the warmer districts. The seedlings should be pricked out a few inches apart in nursery beds where they can develop well and be ready for planting into the borders for next season's flowering.

Bulb planting will be started in the earlier districts in February, and the gardener should now be considering what types and varieties to buy. The best stocks are always sold rapidly at the beginning of the planting season. If the bulbs have to be stored before being planted they should be kept in a cool and dry place.

Compost, provided it is well matured, can be worked into the ground at regular intervals. It is valuable for improving soil texture and the water-holding capacity of the soil. The material should be sieved through a ½in. riddle and the coarse parts returned to the heap for further rotting. The fine material should be spread evenly over the borders and forked in lightly.

Chrysanthemums will be growing strongly by January and attention should be given to staking and tying them. As soon as a clump of shoots is well developed a tie should be made right round the plant to prevent the small side branches being blown off by winds. Late-flowering varieties should be stopped again by pinching the tips out of the shoots to encourage branching and flowering.

Cuttings of a great variety of herbaceous plants and shrubs can be taken in January and rooted in a cold frame or under a bell jar in a shady situation in the open. An inverted glass jar or a box without top or bottom and with a sheet of glass over it probably serves just as well. The object with soft cuttings is to prevent wilting during the first few days after their insertion in the rooting medium (usually soil), and this is achieved by maintaining high humidity. A few of the plants which can be propagated in this way are sweet williams, pentstemons, antirrhinums, hybrid wallflowers, perpetual flowering carnations, and many shrubs, including buddleias, salvias, conifers, and hydrangeas.

Cyclamen are extremely useful winter-flowering pot plants for the house and are not hard to grow. However, the raising of good plants from seed requires about 18 months, and the home gardener is better advised to buy plants in bloom from a reliable seedsman. After the flowers have faded in spring each plant should be dried off gradually and allowed to rest in a cool place outside until January, when it is started into growth again by knocking it out of the pot with its ball of soil and repotting it. Most of the old soil should be knocked off and replaced with fresh potting soil. Plenty of crocks in the bottom of the pot ensure good drainage. The corm is set almost on top of the soil, only its basal part being buried. Flowers of sulphur sprinkled over the top of the corm reduce any tendency to rot. The plant should then be watered thoroughly and stood in a cool, shady place until signs of growth appear.

Freesias are excellent pot plants for the house during winter. Eight or ten bulbs can be potted in a 4in. pot in a potting mixture consisting of 7 parts by bulk of loam, 3 parts of peat or leaf mould, and 2 parts of sharp sand. To each bushel of this mixture should be added 1½oz. of dried blood, 1½oz. of superphosphate, ½oz. of sulphate of potash, and ¾oz. of carbonate of lime. The pots should be plunged into the soil in a cool part of the garden and watered thoroughly. A covering of ashes or light soil about 1in. deep should be spread over the top of the plunged pots. When the shoots appear above the covering the pots should be removed, cleaned, and taken to a sunny position in the house where the freesias will bloom.

Gaillardias bloom freely and make a bright show, especially in hot, dry weather and in poor soils where few other flowers will flourish. Seed of these plants can be sown in January and the seedlings later transplanted to warm, well-drained, sunny sites in the border. Gaillardias can be multiplied by digging the plants in autumn and cutting the fleshy roots into pieces about 2in. long, the end of the cutting which was nearest the crown being cut off square. The cuttings should be placed upright about 3in. apart in sandy soil with the square ends slightly below the surface of the soil. By spring they will have developed roots and buds and may be transplanted to the borders in the usual way.

Herbaceous perennials in the borders should be staked securely as soon as necessary. The criterion of good staking is a garden undamaged after a gale, yet with few strings and ties showing. Plants with massive and heavy flower heads, such as lilies, will grow unsupported for a considerable time but should be staked securely by the time the flower buds appear.

Hollyhocks can be used effectively near a house to break the lines of bare walls. Plants are best raised from seed sown each year during summer, because young plants are less susceptible to attacks by rust fungi. On an old infected plant the rust spores persist from year to year round the crown at the base. If the typical brown spots of rust appear on the leaves, they should be sprayed at once with a spray containing 2 fl. oz. of lime sulphur and ½oz. of colloidal sulphur to 2 gallons of water. Should the plants be near a painted wall, the paintwork should be protected with newspapers or a cloth while the spray is being applied, for sulphur will discolour the paint.

Hydrangeas root readily from cuttings taken from the new shoots at this time of year. Each cutting should be cut off neatly immediately below a bud 3 or 4in. from the

[Douglas Elliott photo.

Cyclamen are extremely useful winter-flowering plants for the house. Their culture is described on the opposite page.

Dahlias grown for show blooms may need to be fed with weak liquid manure. Feeding plants grown for normal border displays is not necessary, as they should succeed quite well if the soil has been properly prepared.

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CASE

tip and inserted in sand in a cold frame. They should be well watered and covered with a sheet of paper to prevent the entry of bright sunlight, and the atmosphere within the frame should be constantly moist. The bottom few leaves from each cutting may be removed for convenience in handling.

Iceland poppies may be planted in January, though recent experience has shown that plantings in February and March are less susceptible to spotted wilt attacks. Seed may be sown in January in boxes kept in a shady position and covered with paper until the seedlings are showing through the soil. As soon as the seedlings are big enough to be handled they should be pricked out about 2in. apart in boxes and later planted into a well-limed bed which has not been manured recently. Plantings made at this time of year will flower late next winter.

Kniphofias, popularly known as red-hot pokers or torch lilies, flower during summer and autumn. They will succeed in comparatively poor soils and dry situations, though most frequently they are planted near pools. They respond well to cultivation and regular dividing every third year.

Lawns should be given their quarterly dressing of fertiliser provided the weather is not too dry. If grass growth has ceased because of dryness and the lawns are brown, the feeding should be delayed, as the fertiliser tends to delay recovery of the grasses. The dressing consists of 3 parts of sulphate of ammonia, 1 part of superphosphate, and 1 part of sulphate of iron applied at the rate of 1oz. per square yard.

Meconopsis betonicifolia (the Himalayan blue poppy) thrives in well-shaded places in the cooler parts of New Zealand and makes an attractive summer display among shrubs and trees. The plants should never be allowed to suffer from dryness. The seeds germinate best if sown immediately after ripening, which occurs about January and February. They should be sown in boxes or pots in a shady position and be planted out as soon as the seedlings are large enough.

Peonies are herbaceous plants which normally flower in early summer. They should not be moved more than necessary after they have become established, for they take a season or two to recover, but evergreen clumps which are many years old should be lifted and divided early in the new year, immediately they have finished flowering. Each clump is lifted carefully, the soil is removed, and the fleshy roots are cut into a number of pieces, each with a crown, and replanted.

Proteas are excellent decorative plants and should be grown more widely in New Zealand. They are grey-leaved evergreens suitable for well-drained, sunny positions and extremely tolerant of drought. The flowers are conspicuous and attractive, though not really beautiful. At this time of year the gardener should observe some of the more popular protea species with a view to deciding which he can grow in his own garden.

Rambler roses such as Dorothy Perkins which finish flowering before the end of January should also have produced a number of vigorous new shoots from the base of each plant. Branches which have flowered should be cut out and the new shoots be tied in to take their places.

Rose blooms should be cut with long stems, as this encourages the growth of new shoots and prevents the bushes from becoming straggly. Faded flowers should be removed by cutting their stems back to the nearest bud or strong shoot rather than by removing only the flower head.

Rock gardens should be overhauled at this time of year, all dead flower heads and pieces of straggly growth being removed. The full beauty of a rock garden cannot be appreciated if it is not kept tidy.

Sweet peas should not be allowed to run wild after their original training in early summer. If dead flower heads are not removed regularly, flowering soon ceases.

Sowings of seeds of annuals for autumn planting may be made in January, including those of winter-flowering pansy, Brompton stock, stock Beauty of Nice, cinerarias, and wallflowers. At this time of year flower seeds are best sown in boxes or pots in a cool, shady place and left there until after germination; by this method the seed soil is more easily kept constantly moist.

Topdressing the flower borders with ½oz. of sulphate of ammonia and ½oz. of superphosphate per square yard is very effective if particularly fine flowers are desired. This dressing should not be given if good dressings of flower border fertilisers were applied during spring.

Violas and pansies will have grown straggly by January and will be exhausted by continuous flowering. The plants should be cut back to within an inch or two of the ground to encourage them to send up new shoots, which probably will provide valuable flowers during autumn. A few plants may be left to provide cuttings which later can be rooted in the cold frame.

Pests and Diseases

Narcissus fly: Cultivating the soil thoroughly where bulb foliage has died down does much to reduce the possibility of attack from narcissus fly by making it difficult for the young larvae to find their way to the bulbs. When narcissus bulbs have been lifted they should not be left lying about the garden, as this provides opportunity for the flies to lay their eggs directly on them. All bulbs that feel soft should be destroyed by burning, as they are probably infected.

Rose mildew is probably the commonest disease of roses in New Zealand. Its attacks are particularly severe where circulation of air about the plants is poor; for example, about rambler roses growing against a wall. This disease can be controlled reasonably well by regular dusting with

Grevillea rosmarinifolia

An interesting Australian evergreen shrub, *Grevillea rosmarinifolia,* as the name suggests, has rosemary-like foliage and clusters of rich red flowers borne during summer. It is of a bushy habit and grows from 4 to 7ft. high and almost as much in diameter.

The grevilleas prefer a lime-free soil and make splendid subjects, particularly for seaside gardens. The best medium for growth is a sandy loam to which plenty of peat or leaf mould has been added. Pruning, which may be done after flowering has finished, is carried out mainly when the shape of the bush is in need of attention.

The plants may be propagated by cuttings 1½ to 2in. long taken from side shoots, with or without small heels of old wood attached, and inserted in sandy compost in a glasshouse or glass-covered frame, box, or pot in January or February. Layering the ends of the lower branches in spring is a method sometimes used.

—*H. P. THOMAS, Vegetable Instructor,*
Department of Agriculture, Wanganui.

flowers of sulphur. A convenient method of dusting is to place some flowers of sulphur in a small bag made of fine muslin, hold the bag close to the plants, and tap it sharply with a stick, causing clouds of sulphur dust which reach most parts of the plant.

Thrips are slender insects up to ⅛in. long and varying in colour from yellow to black. Their attacks are particularly severe on gladiolus. Regular spraying with nicotine sulphate (1 part in 800) plus summer spraying oil (1 part in 100) usually controls this pest. D.D.T. dust is also effective.

Caterpillars of the magpie moth ("woolly bears") attack cineraria leaves at this time of year, looper caterpillars eat geraniums and other plants, and leaf roller caterpillars become common. They can all be controlled by hand picking and by dusting with derris or D.D.T. dust.

Geranium rust, which disfigures geranium plants by producing rust-brown spots on the leaves, can be controlled by regular spraying with 2 fl. oz. of lime sulphur and ½ fl. oz. of colloidal sulphur to 2 gallons of water.

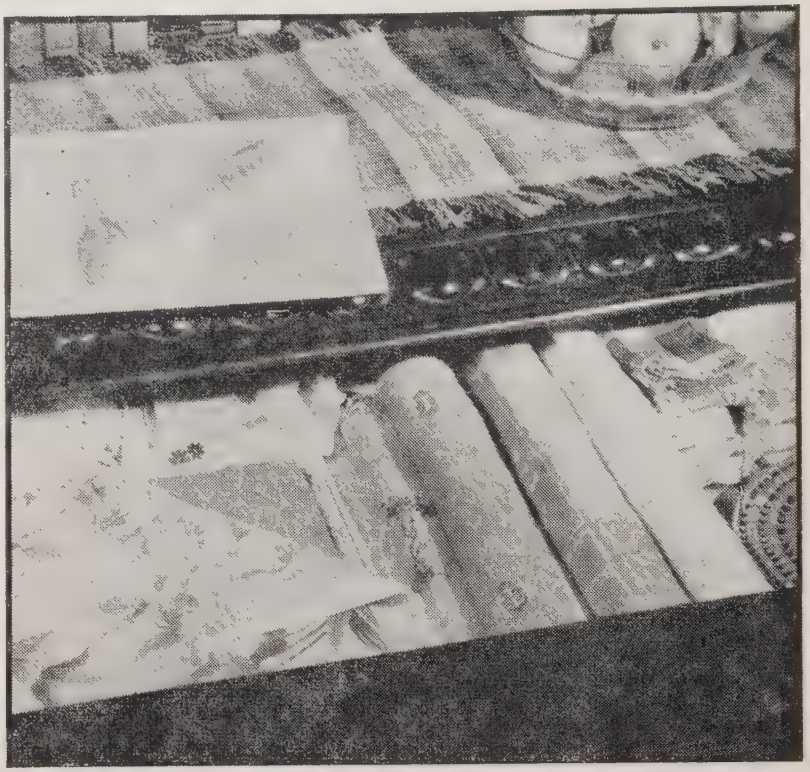
[*Photo News Ltd. photo.*

One way of applying dust to plants—for example, sulphur to roses—is to place some of the material in a small bag, hold the bag close to the plants, and tap it sharply with a stick.

Greenflies are still common in January and should be sprayed at 10-day intervals with nicotine sulphate at the rate of 1 fl. oz. to 4 gallons of water plus 6 fl. oz. of summer spraying oil until all trace of the pest has disappeared.

Subterranean grass caterpillars, larvae of the large nocturnal porina moth, often ruin lawns by eating the grass and leaving large bare patches during summer. Poison baits have been found most effective in controlling this pest; 2lb. of wheat bran, mixed thoroughly with 2oz. of arsenate of lead powder or 1oz. of paris green moistened slightly, makes sufficient to broadcast over 1500 sq. ft. The application should be made on a fine, warm evening. Both arsenate of lead and paris green are extremely poisonous substances and the greatest care should be exercised in using them, especially where there are children or pets. The treatment can be repeated during February if the attack is serious. An alternative to the laying of baits is spraying with arsenate of lead at the rate of 3lb. of paste or 1½lb. of powder per 100 gallons of water.

STORING TABLE LINENS



MOST housewives have found it irritating at times after carefully washing and ironing starched tray cloths or dressing table sets to have to fold them to fit into a cupboard or drawer for storage. Because of the creasing which results, further ironing is often required before the articles can be used again.

ONE solution is to copy the method used by drapers, who roll instead of fold materials which should not be creased. If there are in the house any cardboard tubes of the type used for posting documents, these will make excellent bases for linen rolls. Others can be made of thin cardboard, newspapers, or large magazine pages rolled to form a smooth tube and secured with rubber bands, fine thread, sticky paper, or gum. The articles to be stored are rolled loosely on the tubes, right side out, and if necessary the end can be fastened with a tiny pin. Preferably only one article or one set (dressing table or table mats) should be put on each roll, though it will save space if several tray cloths or table centres of similar size and shape are rolled together. When the rolls are stacked it is still easy to remove the one required.

To make it simple to take a set of place mats from a pile cut sheets of stiff cardboard slightly larger than the mats and slip one between each set. Large cartons and dry-cleaning boxes or suit boxes provide suitable material, and the "dividers" allow the sets lower in the pile to be lifted easily without disarranging those above. If drawer or shelf space is inadequate, keep the sets of table mats in a strong cardboard box covered with wallpaper. A more elaborate arrangement is a cloth cover with a cardboard-stiffened base a little larger than the articles it is to contain. Four flaps of material with edges bound or hemmed are made to fold over toward the centre envelope fashion and fastened with tapes or domes.

This arrangement will keep small pieces flat and together while protecting them from dust and crushing.

Table napkins, neatly folded, are easily stacked, but the piles may grow precarious and topple in a deep drawer or shelf. Cleats 6in. to 8in. long can be attached to the back and front at one end of a deep drawer 4in. below the top to support a light wooden tray or sturdy cardboard box for holding the table napkins. Cleats can also be arranged to hold a full-length tray which can be lifted out when necessary to reach the articles beneath; they also help to make more efficient use of the space in a very deep drawer.

—NORMA K. METSON, Rural Sociologist,
Department of Agriculture, Wellington.

Field Survey of Housing in Vincent County

THIS is the first field study of its type to appear in the "Journal". Results of similar studies in future will be published as they become available. The data for this article by Edith G. McNab, Rural Sociologist, Department of Agriculture, Timaru, and for two to follow were obtained by a field survey of housing in Vincent County, Central Otago.* In these studies close attention is given to the way in which other members of the family affect the work of the housewife.

THE facts provided by the 107 housewives visited in Vincent County are likely to be of interest to country women in general, and these articles will also let the women who assisted the writer know something of the results of the survey.

Chance decided which housewives were called on. One property in 18 was visited in the county and in the two boroughs of Alexandra and Cromwell, giving a total of 65 rural houses (of which 46 were farm houses) and 42 houses in the boroughs. The variety of types of farming and occupations of the families visited is considered to provide a representative cross-section of homes, so the information and opinions collected from the housewives would also be representative of the whole of the county.

> FIELD surveys on the rural home are strange to most New Zealand housewives. A systematic survey with sufficient cases enables the worker to classify groups, to isolate problems, and to draw conclusions that no amount of casual work could achieve. In a well-conducted survey the units studied, whether they be houses, families, kitchens, or individuals, are selected to represent a fair cross-section. Individual case studies can be very informative and useful, but they can also be misleading if they are taken unjustifiably as representative. In any subject a field survey permits a detailed knowledge to be gained, and frequently from this generalisations of wider application than the district studied may be obtained.

Building Materials and Designs

In the earliest days of pioneering the scarcity of building materials and the necessity for making a living severely limited the kinds of houses erected. No timber was available locally, and many of the original buildings were temporary and constructed of makeshift material. Because of the difficulty of transport from Dunedin a minimum of glass and timber was used. There are some interesting survivals of houses built of the durable local materials stone and cob, and another local material, sun-dried bricks, has returned to use.

Cob consists of puddled earth mixed with chopped tussock and tamped down within a wooden framework to form thick walls, the framework being removed later. The cob houses of Vincent were finished by applying mud plaster until the surface was smooth and free from cracks; after that linseed oil was sometimes used to coat the outer surface. The same raw material is used for making sun-dried bricks from which walls are built. Buildings of long life can be made from these materials if they have good foundations and sound roofs with adequate eaves.

The plans of the older houses visited reflected the difficulty of obtaining material. Five out of six houses more than 80 years old had a basic plan of three or more (usually four) rooms opening out of each other. Windows were small and chimneys built outside. This pattern is still used, but to a less extent. Houses built on the same basic plan may differ in details of later additions, porches, and verandas.

As materials became easier to obtain this basic plan had a hall added between the two front rooms. This plan appeared in a third of the houses aged 40 to 80 years, but was not used for houses built later. It seems to have been replaced by the type of house with four to six rooms opening off each side of a straight hall, the front entrance being into the hall. Sometimes the back door also opened into the hall, but more frequently the end of the hall was cut off to form a bathroom and the rear entrance opened directly into the kitchen. By this time chimneys were built between two rooms to serve two fireplaces. Windows became larger and more easily opened.

Among the houses built within the past 20 years floor plans vary more and are less easily classified into basic patterns. There is more building planned to take advantage of sunshine, more grouping of bedrooms and bathroom together and of living rooms together, and more attention paid to planning kitchens for greater convenience to the housewife. Size and type of windows and finishing details show more variety.

The houses visited were built of a number of different materials, more than half being wooden:—

Material	Number of houses
Wood	55
Stone	12
Brick	10
Concrete	10
Corrugated iron	7
Sun-dried brick	6
Cob	4

The cob and stone houses were among the oldest. Neither of these materials is used for new dwellings. Roofs were of iron excepting those of the newer houses, for which tiles have been used.

The building material most suitable in Vincent's climate appears to be sun-dried brick. It has many advantages over wood and iron in particular. One factor contributing to the present popularity of sun-dried brick is that a family which can give some time and labour to making the bricks can reduce the cost of its house.

[*Ellis Dudgeon photo.*

Cob, or tamped earth, is a durable building material, as is shown by this cob house, about a century old, near Nelson. Cob was one of the materials used for house building in the earliest days of settlement in Vincent County, and some such houses still survive there.

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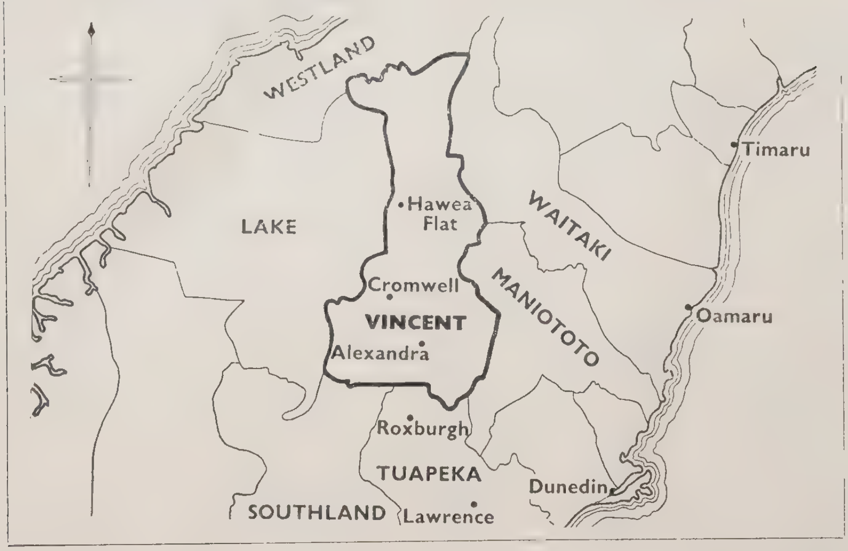
* Data for the survey were collected by the author in her private capacity as a student and not as a Departmental officer.

HOUSING IN VINCENT COUNTY



The average number of rooms in a house was five. Bathrooms, kitchenettes, sculleries, pantries, storerooms, laundries, and unenclosed porches were not counted as rooms, but kitchen-living rooms and sunporches which could be enclosed and used as bedrooms were counted. The number of rooms varied from two to eleven. One standard of adequacy for housing is the room ratio, found by dividing the total number of rooms by the number of people who usually live in the house. About 10 per cent. of the homes had less than one room per person, the most common reason being that none of the children of the family had yet left home.

Facilities and Fittings

Another criterion on which the standard of housing may be judged is the number of facilities. The following table shows the proportions of the houses visited in which certain facilities were present:—

Facility	County	Boroughs	County plus boroughs
	(per cent.)	(per cent.)	(per cent.)
Piped cold water ..	92	100	95
Piped hot water ..	82	95	87
Bathroom	88	100	92
Laundry or wash-house	81	98	88
Water closet ..	43	95	64
Electricity	89	100	94
Electric range only	31	38	34
Coal range only ..	50	45	48
Both coal and electric ranges ..	19	17	18

A smaller proportion of houses in the county than in the borough had piped hot water, piped cold water, bathroom, laundry, and electricity. Lack of electricity was a result of the isolation of some of the homes in the county.

The unusually large number of houses having both a coal and an electric range is accounted for by two facts—the cold winters, making some source of heating in the kitchen desirable then, the coal range serving this purpose as well as cooking; and interruptions to the power supply making an alternative way of heating water an advantage. Therefore the coal range is not always removed when an electric one is installed. The electric range is a boon to many housewives in summer, reducing the discomfort of cooking in the heat and saving work.

In some parts of Vincent County a reliable water supply is not easy to obtain, and it is a prerequisite for a hot-water system and for the installation of a septic tank. Of the houses in the county 43 per cent. had water closets, but the percentage of farm houses having these would be lower, for the county includes the small townships of Clyde and Omakau. Despite the fact that parts of the county have an annual average rainfall of only 12in., three households visited depended on rainfall alone for their water supply, and a number of others used rainfall supplemented by irrigation water, which is not always available at the time or in the quantity desired. Nor are wells or springs always reliable as sources of supply.

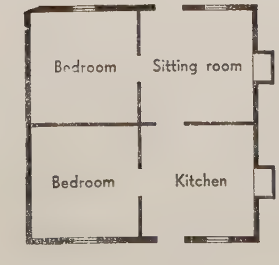
Additions and Alterations

Details of additions made to their houses by the present owners were available in 26 cases. Reasons for additions were one or a combination of the following: To accommodate a family increasing in size, to facilitate the work of the housewife, or to add amenities.

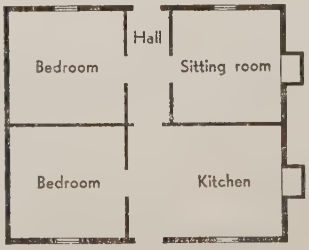
Most frequently additions were bedrooms or sunrooms which could be used as bedrooms. If the kitchen was the only living room, a second living room might be added. Sometimes extra living space was provided by building a new kitchen and turning the old one into a dining or living room. Bathrooms, wash-houses, porches, and water closets were also among the additions.

Most alterations were to the work areas of the house, particularly the kitchen. Sculleries or pantries often were turned into kitchenettes, the old kitchen being used as a dining-living room; this change was as popular in farm houses as in the boroughs.

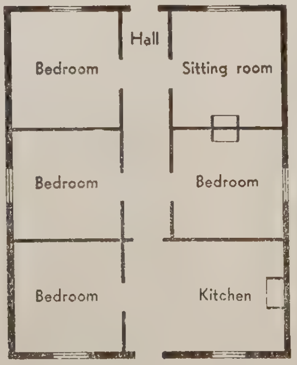
EARLY DEVELOPMENTS IN DESIGN



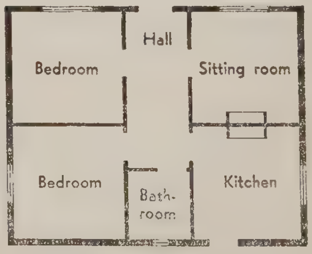
The earliest houses in Vincent County were often built to this plan, sometimes in two stages, two rooms at a time. Usually the chimneys were built on the outside and windows were small, one to a room.



This was a development of the first plan. The back entrance still led directly into the kitchen, but a front entrance hall had been added.



Two more rooms added to the basic design.



By the time this kind of house appeared with a straight hall and four, five, or six rooms, windows were larger and chimneys were built between two rooms, serving a fireplace in each. The end of the hall was cut off to form a bathroom.

The dates of making additions and alterations were significant. There was some waiting for money to become available, but on the whole additions and alterations were made about the time the house was taken over by the present occupants. It would appear to be well for people who have lived for years in one house to take stock of their home and of their manner of life from time to time and decide whether the arrangements within the house are still as suited to their circumstances as they were when the house was first lived in. Changes in the size and composition of the family, the acquisition of new equipment, and other more general changes outside the family during the years may mean that the original arrangements are no longer the most comfortable or the most efficient for work.

Though economy of energy and time reduces many tasks about the house to habit and routine, this process should not be followed blindly for ever, but should be adapted to changing circumstances as the ideas and aims of the family alter. The house is there to serve the needs of the family; it is a means to an end, not an end in itself.

Washing, Ironing, and Airing

A small number of homes had either a separate table or a bench for ironing. Women whose ironing time was broken into short periods found the separate space most convenient, for the time and handling required for putting equipment out or away were much reduced. The ironing equipment is often overlooked when cupboard space is allotted. If it can be kept at the place where the ironing is most frequently done, instead of its having to be collected from several places, work is saved.

Occasionally sewing was done in a spare room, but usually it was carried out in the main living room, which in 41 per cent. of the houses visited was the kitchen.

In almost all houses the hot-water cupboard was used for airing clothes, sometimes supplemented by rails which could be let down from the kitchen ceiling. When the water was heated by a coal range and the cupboard was easily accessible and well provided with rails or racks for clothes, the method was satisfactory. It was less so when the water was electrically heated and the cylinder well lagged to prevent loss of heat and when the cupboard was difficult of access and lacked racks or hanging space. Leaving part of an electrically heated water cylinder uncovered to provide warmth for airing is not desirable, for heat is lost all the time, whether or not clothes are being aired, and as a consequence electricity is wasted. One good airing cupboard was provided with a thermostatically controlled tubular electric heater.

There was some division of opinion on the question of having the laundry under the same roof as the dwelling. Most women recognised the convenience of having it in the same building, but some objected that too much steam would enter the house; good ventilation would overcome that objection. No dissatisfaction was expressed by any woman whose wash-house was under the same roof as the house.

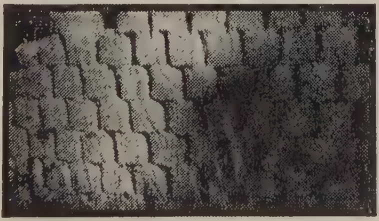
[*V. C. Browne photo.*

Alexandra, in Vincent County, is one of the focal points of Central Otago's flourishing fruit-growing industry.

Toilet Facilities

A water closet was generally agreed to be the best toilet arrangement. In most houses the water closet opened off the laundry, which nearly always meant that the living room or kitchen or both had to be traversed to reach it from the rest of the house, though on the whole it was conveniently reached from outside. Most housewives agreed that the best place for the water closet was not in the bathroom but next door to it, with an entrance from inside the house and another from outdoors directly to it.

Fewer women objected to a water closet in the bathroom if there was a second one elsewhere. In a few instances where there were either young children or elderly people a preference was expressed for a water closet in the bathroom, but in all these cases the housewives considered this arrangement to have drawbacks for other stages of the family cycle.



Sun-dried bricks, such as these stacked awaiting use, are a local building material which was used in the earliest days of pioneering in Vincent and has returned to favour in recent years.

Farmers' wives in particular recognised the need for access to the water closet from outdoors without passing through any rooms of the house. A number of farms had an extra toilet at the farm buildings.

In the older houses the water closet was often added at some date after the house was built and some compromise was necessary in selecting a place for it.

Storage Space

Nearly all housewives desired more cupboards. Most houses had some built-in storage place for food, but many depended on furniture for clothes storage. Because of the climate of Vincent County housewives place a refrigerator high on the priority list for electrical equipment. One type of storage which was often lacking—to the regret of the housewives concerned—was space for cleaning equipment such as brooms, mops, and vacuum cleaners.

Very few houses had carefully planned storage space for all purposes. Access to cupboards was often difficult because they were too deep and doors were too small or hinged at the wrong side. Not all builders or carpenters know what is best for different types of storage, and the only way out of the difficulty is for the housewife herself to be prepared to instruct them at the time the cupboards are to be made. To do this she must study the problem herself. She must make up her mind how much storage space she wants and where it is to be, how deep the cupboards should be and how far apart the shelves, whether racks or rails or any other special features are to be

Farmers

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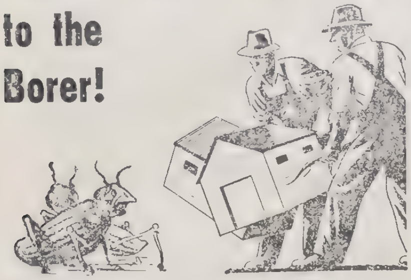

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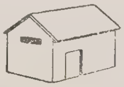
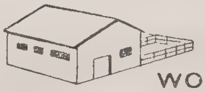
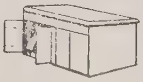
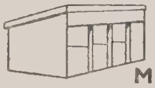




WOOL SHEDS

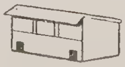
IMPLEMENT SHEDS

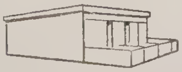




MILKING SHEDS

HEN HOUSES





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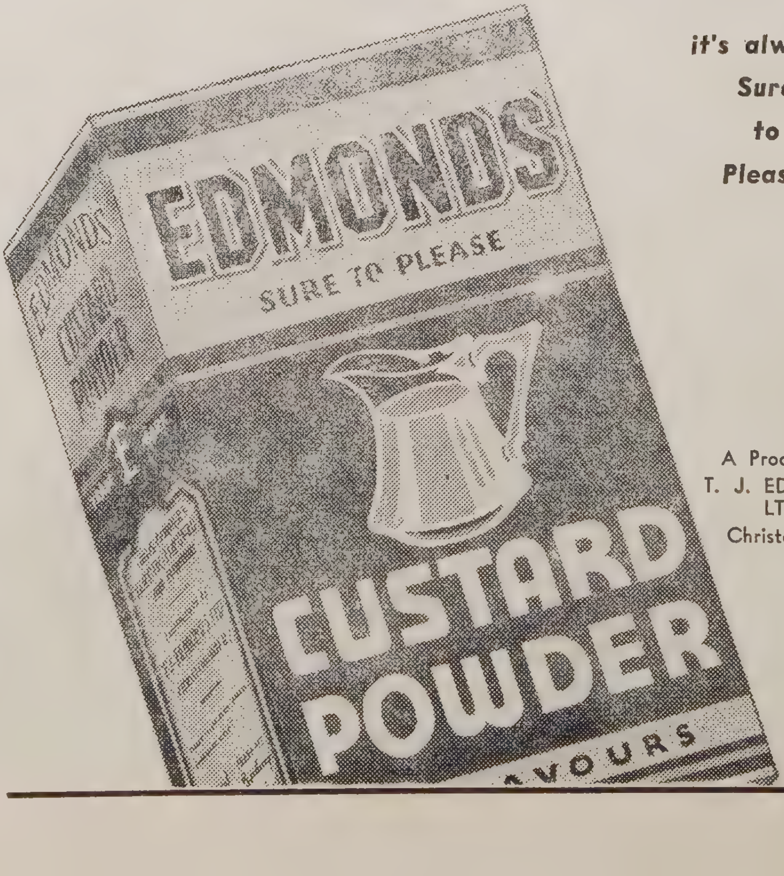

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[*National Publicity Studios photo.*

Frenchman's Point, on the Clutha River, as seen from the main street of Alexandra.

included, and what types of doors are to be used and how they should be hung. To make the most economical use of materials and space each cupboard should be planned round the things which are to be stored in it. The housewife must also know how much of a commodity she wishes to keep on hand and decide what space should be allowed for it. Then she must be able to explain to the workman precisely what is wanted, and see that her instructions are carried out.

Lighting and Heating

Most artificial lighting was of the central ceiling-fixture type, with the lamp exposed. One or two houses had some fluorescent lighting. Local lighting for reading or sewing was rare, except for reading lamps at beds, which were more common.

Ventilation in all cases depended solely on windows. None of the houses visited had a hood over the range to carry off steam and cooking odours.

In most houses the only heating was by open fires. Some homes had electric radiators for occasional use, and a fairly recent development was the use of tubular electric heaters, thermostatically controlled, for background heating. A few people were beginning to use heating stoves of the controlled-burning type, which use fuel more efficiently than do open fires.

There is room for some study of heating methods and factors affecting heating of houses such as building materials, aspect, methods of construction, ventilation, and adaptation to the climate.

Kitchens and Wash Places

It would be interesting to know if use of the kitchen as a living room is increasing or decreasing. In 41 per cent. of the homes visited the kitchen was used as the main living room. While there were houses in which a large kitchen was being altered to serve as a dining or living room, with pantry or scullery fitted up as a kitchenette, in several new houses the kitchen had been planned consciously and most successfully as a kitchen-living room. Only eight of the 107 houses had but one living room.

Most back doors opened into the kitchen, so that, excepting in the six houses in which it opened into the hall, people entering by that door had to pass through the kitchen and possibly another living room before reaching the hall. In more than 70 per cent. of the houses it was necessary to pass through a living room when going either from outside or from the bedrooms to the bathroom or the lavatory. Many housewives dislike the living rooms being used as passageways, particularly when casual farm workers must go through the kitchen to reach the bathroom.

A number of farmers' wives spontaneously raised the subject of having either a separate place in which men could wash and tidy up before entering the house or a bathroom easily accessible from outdoors. In many houses where the bathroom adjoined the back porch providing an entrance directly to it from the porch as well as from the hall would have been simple. In some houses the laundry was used occasionally by the men for washing and tidying before meals, but special provision for convenience in doing so was made in only three homes. In some laundries which open on to a back porch the addition of fittings to encourage its use as a washroom would be comparatively simple, particularly if the laundry already has a hot-water tap.

Arrangement of Entrances

If economy makes necessary an entrance directly into a living room, it is a moot point whether in a farmhouse it may not be better to arrange the front entrance thus rather than the back. This must be decided by each family for itself. On many farms there is little traffic through the front entrance, whereas the back door is in constant use. If the main back entrance must be into the kitchen or living room in a new house, careful planning is called for so that traffic through that entrance will cause as little disturbance as possible to the people working in or occupying the rooms concerned.

Unsheltered entrances were common, even the much-used back door often being quite exposed. This does not affect the cleanliness of a house in Vincent County as much as it would in a wetter district, but in cold weather or where the door is in the side of the house exposed to the prevailing wind it must be undesirable.

Aspect of Rooms

Women who had given some thought to the problem of aspect—and summers are hotter and winters colder in Central Otago than in most other parts of New Zealand—considered that the kitchen should have an easterly aspect, never northerly, and that bedrooms should always receive some sunshine. A number of women favoured a north-easterly aspect for living rooms.

There seemed to be little use of wider eaves as a means of excluding the midday sun in summer and admitting it in winter, but porches as a method of extending the living or resting area of the house in summer were popular.

Planning for Requirements

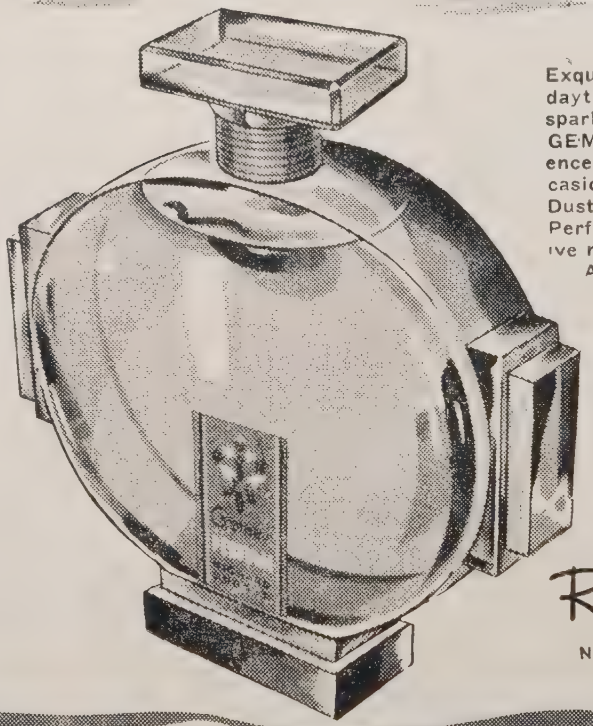
It seems significant that a high proportion of the best-planned houses were those erected for their own families by builders or men engaged in allied trades. Though few people can hope to acquire such wide experience before having a house of their own built, much can be achieved by thinking over the requirements of the family beforehand, discussing the advantages and disadvantages of houses or plans seen by members of the family, and making a close study of plans submitted by the builder. Imagining the family living in the house, with its members going about their usual occupations for, say, a week, will show good and bad points about a plan. Not every home builder can employ an architect, but it may be possible to reap some of the benefits of his knowledge by taking advantage of the limited-plan service, under which the architect, having been given details of the site, the expenditure permissible, and the type of house required, supplies plans and specifications, but does not supervise the work.

A plan may be judged on its suitability for the family and for the conditions under which the family lives and on its adaptability to possible changes in family circumstances. Few families can build houses incorporating all that they desire. Compromises are almost inevitable, but when they are being made the desirable features should be ranked in order of importance and an effort made to keep those which best satisfy the requirements for health, comfort, and convenience for working.

◆

Gemey

PERFUME



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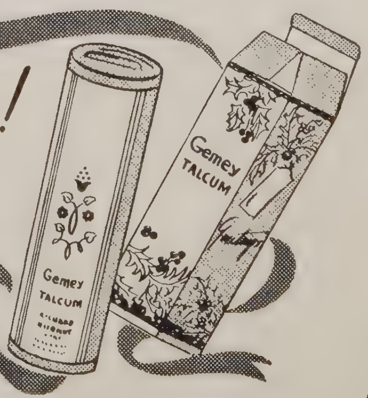


Prepared by Richard Hudnut, Ltd., 21 Federal St., Auckland

G2/50.

THE MUSEUMS OF NEW ZEALAND

INCIDENTS concerned with the establishment of the Otago Early Settlers' Museum and the history of some of its notable exhibits are described in this article, another in this series by Enid B. V. Phillips.

Otago Early Settlers' Museum

ON March 26, 1898, the "Otago Daily Times", New Zealand's first daily newspaper, which was established shortly after the gold rush in 1861, with a future premier as editor, published notice of a meeting to be held on the following Monday evening inviting the native-born sons of old identities to form a New Zealand Natives' Association in Otago, the proposed objects being "to promote social intercourse among sons of the soil, to preserve and strengthen a patriotic spirit, and inspire a feeling of veneration for those heroic pioneers who gave the first shape to our noble institutions".

Inspired by the success of the settlement's recent golden jubilee celebrations, the citizens concerned responded to this laudable proposal with the utmost cordiality, and a committee was set up to prepare a constitution and rules. (A similar organisation had been started about the time of the silver jubilee, but although a very successful picnic for early settlers and their friends was held on the chief postmaster's property in Lower Kaikorai Valley, the society itself was short lived.)

The No. 1 room of the Otago Early Settlers' Museum. The collection of hundreds of portraits of early pioneers on the walls is an outstanding feature of the museum. On the left, near the entrance to the No. 2 room, is a handsome case of period frocks worn in the first 30 years of the settlement.

For Men Only

It must have been rather disconcerting to the "daughters of the soil" to learn that the new association was to be for men only, despite the fact that half a century earlier the authorities had predicted the utter failure of the colonising venture without the co-operation and assistance of "the fairest portion of creation" and urged intending immigrants to marry, a wife by reason of her domestic contribution alone, not to mention her other virtues, being "a great saving to her husband". Apparently the more gallant members of the committee had the grace to realise this, for after "mature consideration" they decided to extend the privilege of membership to the mothers of the settlement, meanwhile comforting themselves with the reflection that, as these were "a fast diminishing quantity", the association would in a few years time regain its masculine exclusiveness. Moreover, the leading article in the "Otago Daily Times" pointed out that in any case there would be no woman under 38 years present and therefore no frivolity, from which it may be concluded that any attempt to imbue proceedings with a little light-hearted gaiety, which is one of woman's chief charms, would be severely frowned upon by the sterner sex. It is interesting to note that the president of the newly formed association was Mr. E. B. Cargill, son of Captain William Cargill, who in middle age relinquished a military career which included distinguished service in India and in the Peninsular War to begin civilian life as a banker in London and who later became leader of the Otago settlers.

The pioneer women of the settlement, becomingly attired in their best silk gowns and beflowered bonnets, attended the association's various social functions in full force, as did their female descendants, and thereby contributed immeasurably to the festive atmosphere of these gatherings, picnics being the favourite form of outing at that time. Furthermore, the achievement of a ladies' committee in raising over £1000 for a building fund by a bazaar must have done much toward convincing the menfolk that their chivalry in admitting women to membership had not been misguided.

Early Settlers' Hall

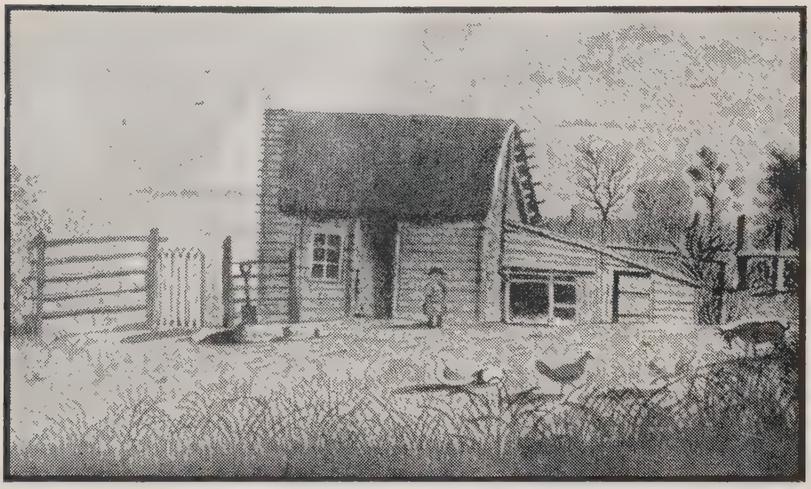
This committee held a second sale of work to provide funds for a piano and other furnishings for the Early Settlers' Hall which was built adjoining the Dunedin Public Art Gallery and which was completed in time for the opening ceremony to take place on Anniversary Day, 1908, the year the province celebrated its diamond jubilee. Soon after the founding of the association a start had been made to collect photographs of the pioneers, and these, suitably framed and in company with views of Dunedin and its environs in the early days, formed an appropriate decor for the hall on opening day. That modest picture and portrait gallery has been so supplemented down the years that it has grown to almost overwhelming magnitude and is of the greatest importance historically. Indeed, one gift to the association was of such imposing proportions that a whole room was required to accommodate it; this was the collection made by Mr. Alex. Thomson, comprising 674 pictures, 306 views, 200 photographs, 310 views on glass, and 311 miscellaneous papers pertaining to early Otago. Fortunately, the Donald Reid wing, erected as a memorial to the association's third president, who held office for 19 years until the time of his death and left the association a generous bequest, had been finished a few months before, so the necessary display space was available and the Thomson collection was on exhibition when the wing was opened in November, 1922, by the late president's daughter, Miss Francis Reid, with a gold key especially presented to her for the occasion.

Another impressive gift received in later years was an index consisting of over 15,000 cards dealing with matters of historic interest in early Otago. About half the cards were devoted to shipping and insurance information, and the entire index was compiled by Mr. J. J. Mallard, president of the association for 5 years.

Purchase of Buildings

By 1928 the association was able to purchase the former art gallery buildings (the 1925-26 exhibition art gallery became the permanent home of the city art collection; it was purchased from the exhibition company by Mr. and Mrs. P. R. Sargood for presentation to the city as a memorial to their son who was killed in the First World War), thus making welcome provision for a Pioneers' Hall and additional room for the constantly increasing collections of historic relics.

Twenty years later it was found necessary to appropriate this hall as well as the Early Settlers' Hall to meet the needs of the association's museum, which had been greatly extended in preparation for the centennial exhibition which was formally opened by the Governor-General, Sir Bernard Freyberg, on February 25, 1948. Anniversary Day celebrations that year were prefaced by the re-enactment at Port Chalmers by the Port Chalmers Old Identities' Association of the landing of the pioneers from the John Wickliffe, the first ship chartered to bring immigrants to Otago. A happy feature of the afternoon festivities, arranged by the Otago Early Settlers' Association,



[*From the Alexander Turnbull Library photographic collection.*

Built of wattle and daub in 1848, this house was typical of many erected in the early days of the Otago settlement. The framework consisted of saplings placed side by side, wattles being lashed across them latticewise and interlaced with flax or grass. The interstices were plastered with a mixture of clay, chopped tussock, and water, and the roof was thatched with grass. Owing to the scarcity of glass the windows were correspondingly small.

was the presentation of a bouquet to Lady Freyberg by the great-great-granddaughter of Mr. John Jones, who owned the whaling station at Waikouaiti and who founded a prosperous agricultural settlement on the large block of land he had bought from the Maoris, the little band of settlers arriving from Sydney on his whaling vessel, Magnet, in 1840, about 3 months before the signing of the Treaty of Waitangi. It was at Mr. Jones's request that the first mission station was established in the South Island, the Wesleyan Mission Board in Sydney appointing the Rev. James Watkin to the charge.

Missionaries' Arrival

Mr. and Mrs. Watkin and their young family left Sydney in the Regia on May 1, 1840, the trip taking just over a fortnight and culminating in a terrible storm in Fouveaux Strait which caused serious danger of shipwreck. Although they had two other hair-breadth escapes from disaster before they finally landed at Waikouaiti, Mr. Watkin held Divine services the following day (Sunday), taking his text from Timothy, "This is a faithful saying".

As the house Mr. Jones had provided was not nearly big enough for the family, they had to make do in a Native whare until a more suitable residence could be built for them. The new, 4-roomed mission house, with its timbered walls and shingle roof, its pleasant fireplace and sturdy chimney of Sydney fire bricks (the first in the South Island), must have seemed like a palace after the draughty, uncomfortable whare. Some of the chimney bricks survived the rest of the dwelling by many years, and before they, too, disintegrated under the relentless attacks of time and weather one was secured for the Otago Early Settlers' Museum, where it is on view today.

Despite the toll 7 years' service in the Tongan mission field had taken of their health before they came to Australia, the "unwearied exertions" of this devoted missionary couple in the vast, isolated parish of the South Island of New Zealand were prodigious. In addition to her family duties, which were further increased by the birth of two sons during her sojourn at Waikouaiti, Mata Wakina, as the Maoris called Mrs. Watkin, taught the Maori women and girls cooking, sewing, and the rudiments of child care. Her classes were so popular that pupils came by the boatload from as far south as Otakou to profit by her instruction. Moreover, the Maoris were particularly eager to learn the pakeha arts of reading and writing, and the Watkins' parlour was often filled with students of all ages diligently learning their letters or mastering the hymns and prayers which James Watkin had painstakingly penned in their own language. The British and Foreign Bible Society's gift of New Testaments printed in Maori was largesse indeed and occasioned widespread rejoicing among the Maori population.

Gun Barrel as Church "Bell"

Mr. Watkin accomplished his extensive pastoral visits by boat and on foot, both modes of travel being attended by considerable hardship and danger. He established churches at Otakou, Tahakopa, and Ruatitiko, where the Old Testament prophecy anent swords being beaten into ploughshares had its modern equivalent in the form of a gun barrel which, suspended from a rope of flax, was struck with a stick at rhythmical intervals to serve as a bell to call the people to worship. Another preaching place was at Omati, the whaling station run by three brothers from Sydney, Joseph, George, and Edward Weller, whose New Zealand-built ship, the Joseph Weller, plied regularly between Otago and Sydney. Two of the trypots from the Wellers' station are now in the museum, together with one of the last whaleboats in use at Waikouaiti. Mr. Watkin, writing to a friend from Waikouaiti, mentioned that although the whalers went out on the Sabbath in defiance of Mr. Jones's desire for the proper observance of the Lord's Day, it was remarkable that they had not been successful in taking a single whale on a Sunday during the entire season.

The year 1844 was a momentous one for the mission household. Bishop Selwyn spent 2 days with the Watkins early in January during his first visit to the South Island, and the Rev. Charles Creed, the pioneer minister in Taranaki, arrived in mid-April to relieve Mr. Watkin, who was then to be transferred to Wellington in accordance with the Wesleyan custom of changing circuits every 3 or 4 years.

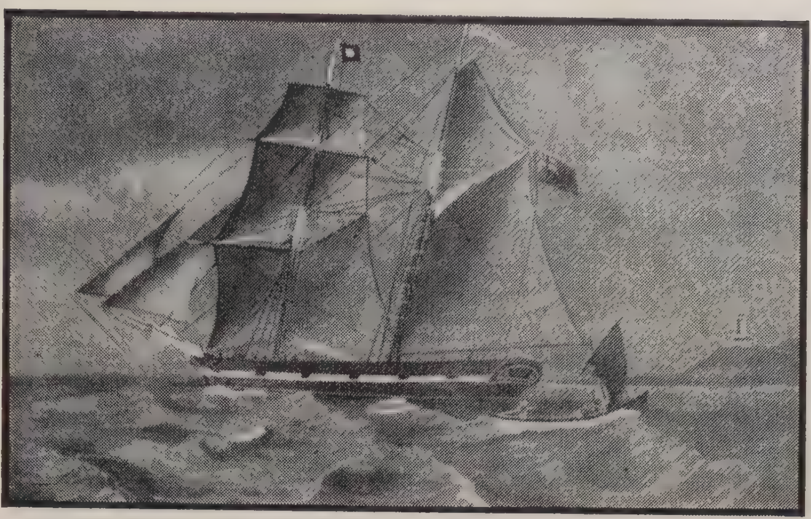
The brigantine Deborah, 121 tons, brought other passengers beside the Creeds and their baby daughter, who was born on the voyage to Waikouaiti. There were Frederick Tuckett, chief surveyor to the New Zealand Company, Dr. (afterward Sir David) Monro, of Nelson, other members of the survey party, and Rev. J. F. H. Wohlers, newly sent to New Zealand by the North German Missionary Society. Thus came about the meeting between the former missionary to Tonga, whose printed plea for helpers to preach the Gospel to the Fijians was circulated in Germany as well as in England, and the young Lutheran who had become a missionary as a result of that appeal. It must have been a great joy to Watkin to learn that Wohlers intended to begin his ministry in the Fouveaux Strait area, with Ruapuke, the biggest of the islands between Bluff and Stewart Island, as his headquarters, for his own efforts to visit the native settlement at Ruapuke had been frustrated by stormy weather which had made the anchorage unsafe and prevented his landing.

Old Chart and Medicine Chest

The Deborah stayed several days at Waikouaiti before proceeding south, Frederick Tuckett continuing with his task of exploring the country for a suitable location for the proposed Free Church settlement. He was extremely thorough in his exploration, often going overland through rugged bush terrain and catching up the ship at various points along the coast. After disembarking the Rev. Wohlers at Ruapuke he spent some days in the Bluff and New River localities before sailing for Paterson's Inlet, Stewart Island. The chart of the island and the strait drawn by Captain Wing of the Deborah and bearing the acknowledgment: "All the west coast of the island is layed down as directed by Mr. Edward Palmer who has been many years sealing on all the rocks and places adjoining Stewart Island; Mr. Palmer was also pilot on board the brigantine Deborah", was presented by his descendants to the Otago Early Settlers' Association, and the medicine chest which Tuckett carried on that long journey south is also in the association's possession and displayed among the notable exhibits in the museum.

Dr. Monro's description of his travels is written in a delightful, smooth style as befits a man destined to represent his district in Parliament and occupy the distinguished position of Speaker in the House of Representatives. Tuckett's entries, on the other hand, are so succinct as to produce almost a staccato effect, save for occasional passages where his subject compels him to unwonted fluency, such as his difficulty in securing reliable information as to distances and the correct names of rivers and districts, and his indebtedness to petticoat government at one stage when he was unable to obtain a Maori stalwart to carry his baggage, whereupon a Maori woman promptly persuaded her wavering spouse to accompany the pakeha and, more important still, render loyal and able service.

Tuckett's choice of Otago for the new Presbyterian settlement was a happy one and met with the approval of Colonel W. H. Wakefield, the two representing the New Zealand Company at the big Maori gathering at Koputai (the port which was later called after Dr. Thomas Chalmers, a noted churchman) where the sale of the Otago block to the British authorities took place.

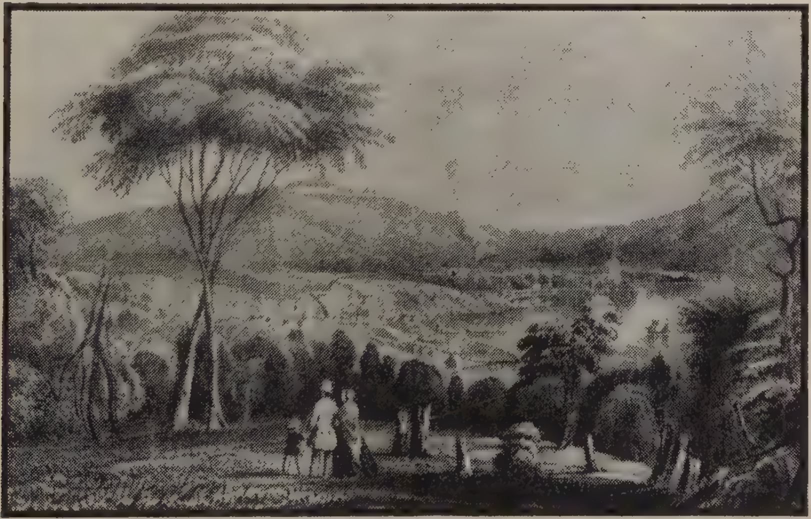


[From the Alexander Turnbull Library photographic collection.

The brigantine Deborah, which conveyed Frederick Tuckett, the New Zealand Company's chief surveyor, from Nelson on his journey south to select the site for the Otago settlement. Among the passengers were the Rev. J. F. H. Wohlers, a young Lutheran missionary whom Tuckett befriended, and the Rev. Charles Creed, of Taranaki, who had been appointed to Waikouaiti to relieve the Rev. James Watkin, the pioneer missionary in the South Island. A copy of this painting by M. Russell hangs in the museum.

Tuckett made his home at Koputai in a little brick house he built on the beach, living there the greater part of the time until his return to England in 1847. The Rev. Creed in his diary mentions spending an evening with the chief surveyor after he had been across to the future New Edinburgh (Dunedin) to preach to the few Europeans in the vicinity, the Methodist missionary thus being the first to hold Divine service on the site of the Presbyterian settlement. Tuckett's successor, Charles Henry Kettle, and his wife, who arrived from England on the Mary Katherine in February, 1846, had to share the 3-roomed brick cottage with one of the assistant surveyors for a time, and later the tiny cottage had to be turned into a temporary hospital, the forerunner of Otago's outstanding services in the medical field.

The old-style chain, composed of 100 links, which Kettle used when surveying the site for the city of Dunedin has an honoured place in the museum and several weeks before her death in 1932, his daughter unveiled a memorial plate in the pavement in Water Street where she had been carried by her mother 84 years before to watch the landing of the first of the John Wickliffe's passengers, the vessel having left Greenwich on November 24, 1847, with 94 immigrants for the new settlement under the leadership of Captain William Cargill. Incidentally, Frederick Tuckett took advantage of the ship's sailing to send tools and books to his friend Johann Wohlers to help him in his lonely labours on Ruapuke.



[From the Alexander Turnbull Library photographic collection.

The view of Dunedin from Little Paisley in the 1850's is one of the earliest pictures of the Otago settlement in existence. The locality was called Little Paisley by some immigrants who came from the town of that name in Scotland, where they had been weavers.

Model Ship

The museum has a very fine model of the Philip Laing, which brought 247 passengers to Otago in charge of the Rev. Thomas Burns. This second ship left Greenock only 3 days after the John Wickliffe, but arrived in New Zealand more than 3 weeks after the John Wickliffe. Some of the more censorious passengers attributed its tardiness to the fact that the captain preferred to promenade the deck in the starlight with the Rev. Burns's pretty daughter Clementina instead of devoting his energies to achieving a record run. Perhaps they would not have begrudged him those brief halcyon hours could they have foreseen that this romance which led to the couple's marriage, the first recorded in Dunedin, would be cut short by the death of his wife at the early age of 30.

Pioneer Housing

The lot of the settlers who arrived in 1848 was a hard one, the sole accommodation for most of them being long, windowless, shed-like shelters fashioned from rough wooden frameworks with only grass and rushes for lining and somewhat euphemistically

The interior of the kitchen in the model of a pioneer's cottage set up in the museum. The cottage is 3 roomed and the furnishings are typical of those in use in a pioneer's home 100 years ago.

termed barracks. Winter came early to Otago that year and the picturesque grass thatch was not proof against the incessant rain and there was no cheerful open fireplace or stove of any kind to offset the chill winds which penetrated the flimsy walls. Umbrellas were de rigueur indoors and the puddles underfoot changed the clay floors into miniature ponds and patches of bog which were at times "mid-leg deep".

No wonder the womenfolk, whenever possible, set to work to help their husbands to build their homes, tackling such unaccustomed tasks as lugging newly sawn timber from the bush, gathering materials for thatching, and mixing clay, chopped tussock, and water to form a crude plaster to fill in the narrow, grass-laced interstices between the walls of wattles and saplings. Wattle-and-daub construction was most generally used, though sods, tree ferns, and sun-dried bricks also had a place in this primitive housing programme. A model house of this kind can be inspected in the museum, entrance being effected through a door in an appropriate mural, one of a striking series depicting pioneer life in Otago painted for the centennial exhibition by J. W. Brock and C. V. Wheeler.

Household Equipment

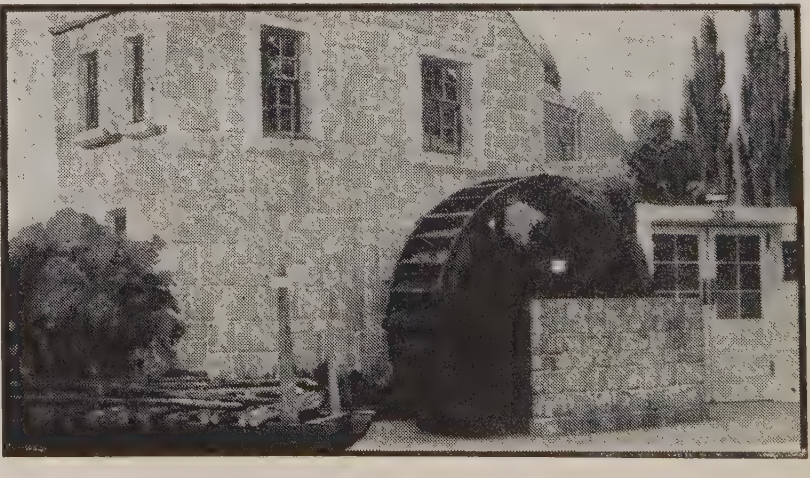
The museum also has a full complement of pioneer household equipment: Candle moulds, charcoal irons, and an antiquated coffee mill; a portable camp oven like a gargantuan preserving pan with a circular lid on which to heap the hot embers; its more elaborate counterpart, a colonial oven resembling a small coffin with a door in the side and conveniently fitting into a fireplace so that a fire could be kindled both on top and beneath according to the degree of heat required; a hook and sweigh with a heavy iron kettle attached; and a choice selection of churns, including the settlement's premier model, contrived with characteristic Scottish thrift and ingenuity in making the best use of available material—a water cask from the Philip Laing. Sawn-down barrels also did duty for seats as did vertebrae of whales brought from the Heads. Packing cases, too, were pressed into service as furniture until there was opportunity to try cabinet-making with native timbers. The museum possesses many examples of the early work of the amateur craftsmen, also 3 carved chairs used by the Otago Provincial Council, which held its first meeting in the Mechanics' Institute on December 30, 1853.

Chair for First Judge

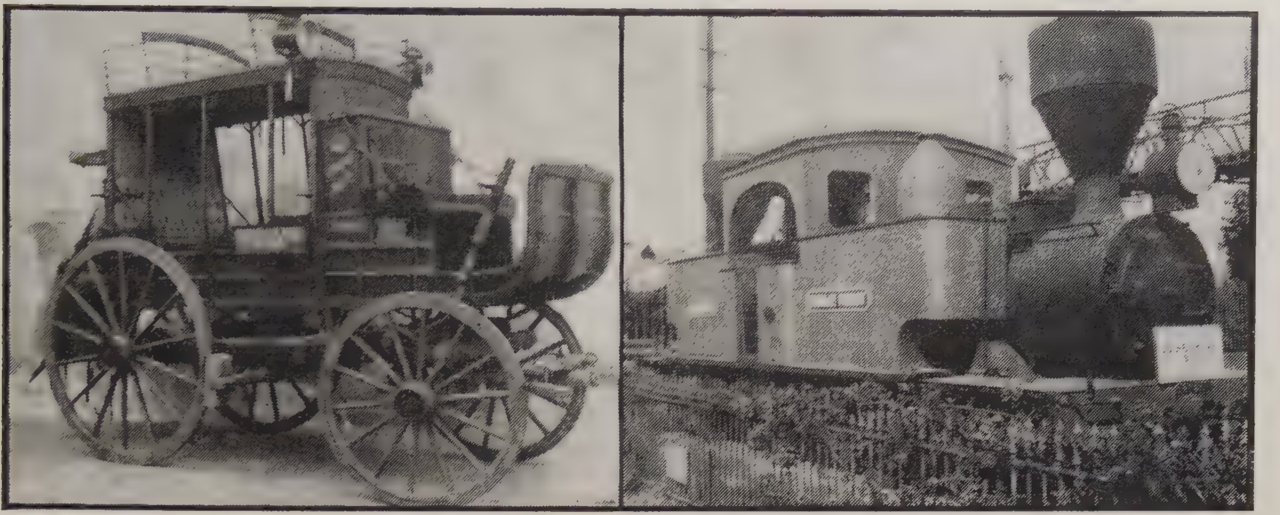
Another interesting item is the chair made by Mr. John Hill for the first Judge of the Supreme Court of Otago, Mr. Sidney Stephen, whose appointment by Governor Grey was far from popular with the Scots for his salary of £800 a year was considered a severe and unnecessary drain on the limited finances of the young province. A more law-abiding community would have been hard to find. Indeed, the local lock-up was so little used that it often served as a meeting place for the Methodists when the Rev. Creed held church services when visiting Dunedin. Moreover, the Anglicans, having neither church nor cathedral, gathered for worship in the Supreme Court building, now the site of the present gaol, the services being brightened by the acquisition of a barrel organ which played 36 hymn tunes and had been brought to New Zealand by Dr. Frederick Hall Richardson, who arrived in Otago in 1851. (This was the instrument which greatly interested our present King when, as Duke of York, he inspected the museum on his New Zealand tour in 1927, the joyous strains of "O Come All Ye Faithful" reverberating through the museum as he vigorously turned the handle.)

Nevertheless, the half-yearly sittings of the Supreme Court were conducted with the utmost ceremony, many of the jurors travelling long distances to attend, even though there was a complete absence of crime on the calendar. These farcical proceedings came to an end in 1850 when the Judge himself brought an action against a popular Dunedin belle, with whom he had been conspicuously friendly, for "wilfully and wickedly conspiring" with two well-known citizens to damage his reputation. One of the lady's champions immediately retaliated by beginning proceedings against the Judge for threatened assault in a public thoroughfare.

Both charge and countercharge held that element of drollery which would have delighted the British dramatist W. S. Gilbert, and the legal comedy concluded on an unexpectedly sensational note when His Honour, after having been exonerated by the Bench, which comprised no fewer than 11 Justices of the Peace, was roundly



A mural painting of a mill forms an appropriate setting for a large water-wheel displayed in the Pioneers' Hall of the museum. This mural is one of an extensive series depicting typical Otago scenes painted by the artists J. W. Brock and C. V. Wheeler for the centennial exhibition which opened in February, 1948.



Two exhibits of early transport which belong to the museum. Left—A Cobb stagecoach. Right—Josephine, Otago's first railway engine, which now stands outside the museum at the north end of the Donald Reid wing. Built by the Vulcan Foundry Ltd. in Lancashire in 1872, this pioneer locomotive made its trial run on the Dunedin-Port Chalmers line on September 11 of that year, the official opening ceremony taking place on December 31. Later it was used by the Public Works Department before its purchase by the Otago Iron Rolling Mills, by whom it was presented to the museum.

rebuked by that eminent personage, Dr. Henry Manning. Although Dr. Manning habitually wore his raven curls shoulder length he was anything but effeminate and challenged the Judge to a duel. However, Judge Stephen was spared this unpleasantness, as he sought the protection of the Court, which ordered the doctor to keep the peace. The Judge was recalled to the North Island soon afterward and fully 7 years elapsed before another Judge was appointed to the Supreme Court of Otago.

Surgical Instruments

The box of surgical instruments which Dr. Manning brought with him on board the John Wickliffe is now in the museum, together with the diploma from the Royal College of Surgeons, dated 1833, belonging to Dr. Joseph Crocombe who arrived at Otakou in 1836 and was thus the first doctor to practise in Otago. At Waikouaiti, where he settled a couple of years later, he undertook the task of tutor to the Jones children, and in later life he carried out the duties of postmaster and registrar of births, deaths, and marriages for the little settlement, which played such a valuable part in producing foodstuffs for the Free Church pioneers until they could grow their own crops.

The piano (the first in Otago), on which the Jones family demonstrated their musical prowess during their residence at Waikouaiti, is now a museum piece. Dr. Edward Shortland, in the diary he kept on his memorable journey through the South Island in 1843, records pianoforte items as part of the evening's entertainment when he visited the Joneses in October of that year. Another exhibit linked with Waikouaiti's early history is the bell used at the mission station before the arrival of the John Wickliffe and transferred not long afterward to the Church reserve at Dunedin which was subsequently known as Bell Hill. This bell originally belonged to one of the Botany Bay convict vessels and was purchased by Mr. Jones for his whaling vessel Magnet. He later presented it to the mission station.

Cannon Timepiece

The cannon which preceded the much-travelled mission bell as Dunedin's first public timepiece and which was fired at noon each day and incidentally served as the lunch-hour signal for the roadmaking gangs employed by the New Zealand Company on the construction of Princes Street, is also housed in the museum. (Mud of varying depth and tenacity was the bane of Dunedin's roadworks for many years, several of the town's principal streets being in such a parlous condition in wet weather that the chivalrously inclined escort frequently found himself cast in the role of St. Christopher instead of following the example set by Sir Walter Raleigh. Further, the elaborate fashions of the period, with their voluminous skirts and fanciful forms of trimming, as typified by the museum's showcase of frocks worn in the first 30 years of the settlement, must have made pedestrian excursions along these primitive thoroughfares particularly trying for women.)

The foundation stone of First Church, a Gothic gem in grey Oamaru stone, was laid by the Rev. Thomas Burns toward the close of his ministry; his Bible is used in the church on Commemoration Day every year and then ceremoniously returned to the Early Settlers' Association, which is also in charge of the Bible inherited by the co-founder of the settlement, Captain Cargill, from his heroic forebear, the Rev. Donald Cargill, the Covenanter who suffered a martyr's fate at the Edinburgh Grassmarket in 1681.

Robert Burns's Snuff-mull

The museum is indebted to the first minister of Knox Church, the Rev. Dr. D. M. Stuart, for the snuff-mull which belonged to the Rev. Burns's famous uncle, the ploughman-poet Robert Burns. The mull, which is inscribed, "Craigdarroch—Robert Burns, 'The Bard of the Whistle,' October 16, 1790", was brought by an Englishman named Robertson with the happy intention of presenting it to the Scottish settlement in the far-off Antipodes. Dr. Stuart, whose tragic misfortune in the loss of his young wife only 2 years after their arrival in New Zealand in 1860, leaving him to be father and mother both to 3 little boys, gave him a special insight and compassion in ministering to the sufferings of others, was the chosen recipient of Robertson's generous gift. A lock of hair is another prized relic of the great ploughman-poet, and an exhibit equally likely to rouse the Scottish visitor to patriotic fervour is a set of bagpipes played at the relief of Lucknow.

Relics of Gold Rush Days

The museum has a comprehensive collection of mining and sluicing implements used during the gold rush era which followed the discovery of gold by the Australian miner Gabriel Read, who unselfishly made the news public through the Press so that others might share his good fortune. The two panels flanking a doorway in the Pioneers' Hall formerly graced the hall opened as a meeting place for the Chinese community in the Lawrence district some 70 years ago, there being a large percentage of Chinese among the influx of overseas diggers who flocked to the Otago goldfields. The exquisite calligraphy is interpreted as follows: "May this hall enjoy the guiding and protecting care of heaven shining in this distant land", and "May the people act with kindness and righteousness in return for kindness and righteousness received with congratulations on the opening of this public hall". (The latter statement probably referred to the Church's friendly gesture in appointing a special missioner to serve among the Chinese, that minister having first proceeded to Canton to study the Chinese language so that he would be better fitted for his charge.)

The stagecoach with its handsome upholstery and gleaming headlamps and the proud legend "Royal Mail" emblazoned on the side of the driver's seat also belongs to the days of the gold boom, the coaching service in Otago being an offshoot of the enterprising American firm of Cobb and Company, founders of a similar service between Melbourne and the goldfields of Victoria in 1853. The bullock wagon which appears so cumbersome in comparison with Cobb and Company's magnificent coach was used to transport supplies to the Otago miners. Another relic of this romantic period is the whip belonging to Ned Devine, the outstanding coach-driver of his day, his most important passenger being New Zealand's first Royal visitor, the Duke of Edinburgh, who landed from the Galatea at Port Chalmers on April 26, 1869, and was driven to Dunedin in a state carriage drawn by eight greys. Ned Devine's handling of his team on that memorable occasion was "a revelation to the Duke", a skilled whip himself.

During the address of welcome and the tumultuous cheering which preceded the Duke's triumphal procession through the town the redoubtable Ned is said to have "sat upright on the box seat at the end of the rigid ribbons immovable as a graven image". The Duke of Edinburgh Stakes, the chief event of the two-day race meeting held on the Silverstream course in honour of His Royal Highness, was won by Ned Devine's Captain Scott. (Incidentally, the Duke's headquarters in Dunedin were at Fernhill, the beautiful home built by Mr. John Jones when he left Waikouaiti to go into business in Dunedin; after his death the house was acquired by the Fernhill Club.)

First Locomotive

Some 3½ years after the Duke's visit Dunedin was again en fete, this time in honour of the Governor, Sir George Bowen, who had come south specially to open the Dunedin-Port Chalmers railway. The trim little engine which drew the official train was the first one used in Otago and had been built in Great Britain and was named Josephine. This pioneer locomotive played a prominent part in rail communication between the city and the port for many years and later came into the possession of the Public Works Department for a period before being bought by the Otago Iron Rolling Mills. Later it was presented to the Early Settlers' Association, being placed on the grassy plot outside the museum at the north end of the Donald Reid wing within sight and sound of the tracks it had travelled so often in the pioneering days.

In recent months this engine has been joined by a contemporary, the 75-year-old locomotive from the Dunedin gasworks. Dunedin's first fire engine, a primitive manual apparatus, known as Alice, served the city from 1863 to 1910 and had a lengthy term of military duty, being employed by the army for 7 years at Dunedin and for 5 years at Trentham. Alice returned to her home town and for some years now the "pride of Dunedin" has queened it over the old-time ploughs and chaffcutters, the penny-farthings and velocipedes, the lithographic press on which the first block maps of Otago were printed, a typewriter dating back to the 1860's, the first telephones in use a decade later, one of the first New Zealand-built wireless sets, and other interesting evidences of the settlement's progress exhibited in the museum.

Vintage Whisky

Perhaps the most surprising item of all to find in a museum is a flask of whisky. This particular bottle was given to Mr. J. C. W. Gilmore by his mother to cheer him on his way when he left for New Zealand in 1862. With remarkable strength of will he determined to keep the gift intact until he became a centenarian, when he proposed to broach the bottle during his hundredth birthday celebrations, but he did not live quite long enough, his death occurring at 95. Hence his carefully cherished whisky remains unopened to this day.

A great deal of the success of any society usually depends largely on the efforts of the secretary and the Otago Early Settlers' Association is no exception in this respect, being singularly fortunate in having only five changes in this important office in the 52 years of its existence. For the past 7 years the activities of the organisation, which was once intended to consist of male members only, have been ably administered by Miss M. M. Pryde, the museum, too, being under her supervision.

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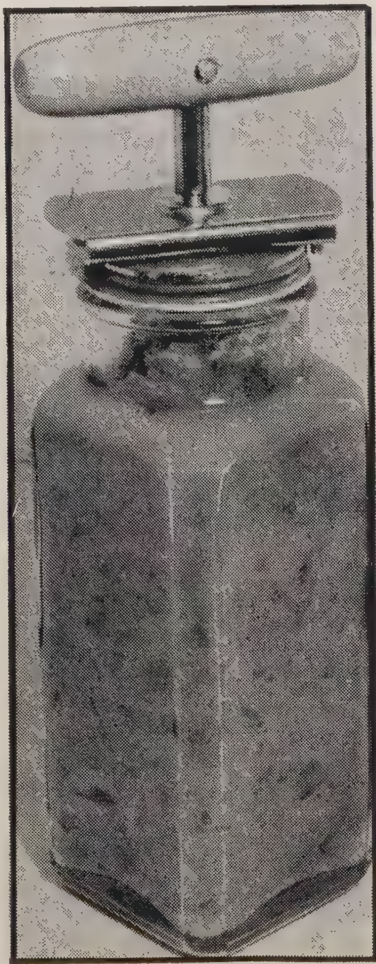
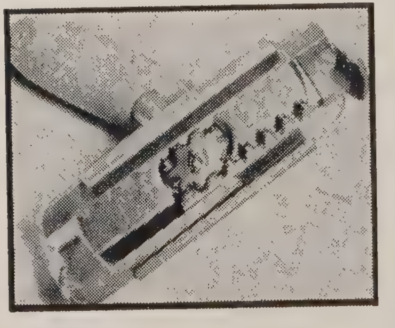


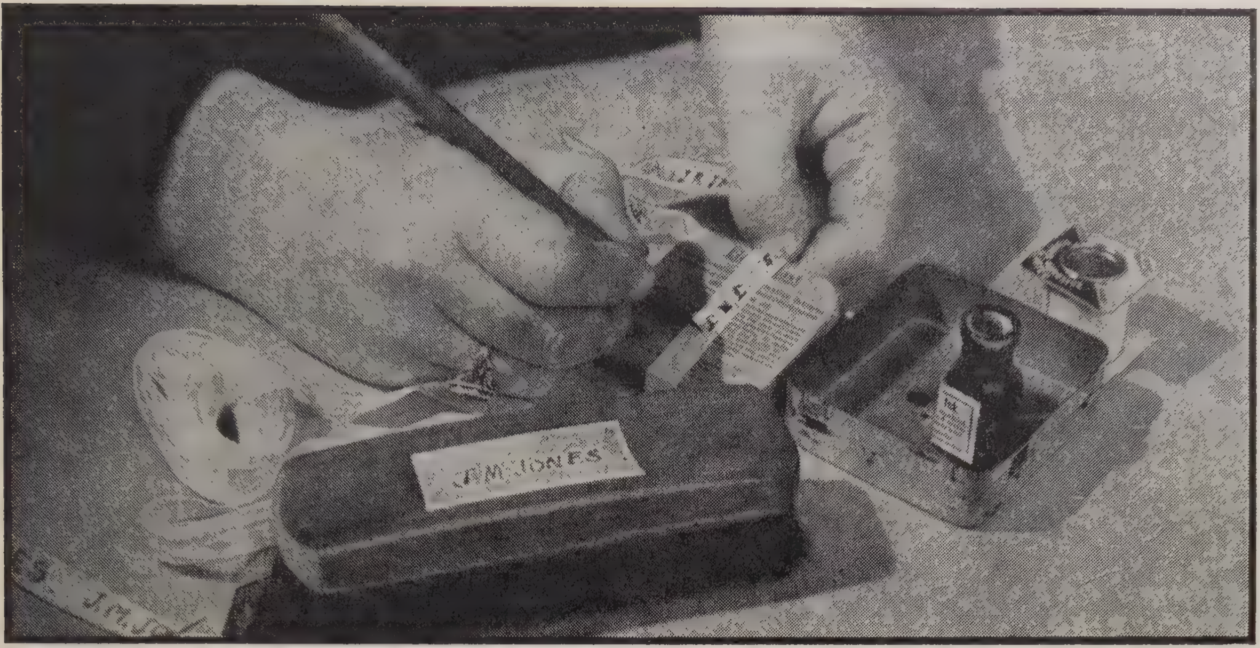
Gadget for Removing Refractory Jar Tops



SCREW tops that corrode on jars and bottles and become so firmly fixed that their removal is well-nigh impossible are one of the housewife's problems. Pliers are a help for small bottles, but pickle jars present more difficulty. Now there is a gadget specially made to meet such situations and to cope with various sizes of tops. It has a metal plate, a ratchet wheel, and toothed, adjustable sides. It is set on the stubborn lid and the handle turned until the toothed slides grip the lid. With slight downward pressure on the handle and a turn the lid is removed easily.

—*EVA TOPPING, Rural Sociologist,*
Department of Agriculture,
Auckland.

Photographs by Sparrow Industrial Pictures Ltd.



Marking School Clothes and Equipment

By NELL MACPHERSON, Rural Sociologist, Department of Agriculture, Auckland.

WHETHER a child is a day pupil or a boarder at school, his belongings should be marked clearly in a prominent place to prevent their loss. This marking should be as permanent as possible on both equipment and clothes. If all belongings are properly marked, there is less chance of their being mislaid and they are more easily found if they have gone astray.

THE child's initials and the surname in full should appear on every article in a prominent place. Initials alone are not satisfactory, as sets of initials may be duplicated in the school. If a child is at boarding school, all his property must be marked and with a day pupil all clothing which may be removed at school should be marked. This of course includes sports clothes, bathing suits, towels and caps, and underwear.

Clothing

Clothes in light-coloured materials may be marked directly on the garment with marking ink. The name should be on the centre back of the waist band or the back of the neck. Dark garments should be marked with firmly sewn named tapes. Trade-embroidered name tapes are the perfect way of marking, but they are not always available. Cotton or linen tape, however, can be marked with marking ink and backstitched or machine-stitched firmly to the garment.

Knitted garments should be stretched before tapes are sown on. To mark the garment or the tape stretch it firmly over a smooth surface and hold it so that the surface remains taut. Use a fine nib, do not have too much ink on it, and make fine strokes, as the ink tends to spread a little. Slanting block letters are the most legible and are easy to do. If necessary, outline the letters with a lead pencil first as a guide. Place newspaper under the name and also over it if a number of garments are being done to prevent smudging and blotting on another surface. Always follow the instructions given with the marking ink about drying time.

The name can of course be embroidered in contrasting thread on the garment. Backstitched names done in this way will outlast the garment, but they take considerable time to do. Special care must be taken in marking raincoat belts, gym. girdles, ties, and hat bands.

Shoes

Shoes also need marking. This can be done by marking the lining or under the tongue with marking ink. Indelible pencil is fairly lasting, but if the feet perspire much it will run and mark socks as well. Sticking plaster marked with ink is fairly satisfactory, but it must be renewed from time to time.

Hats and Caps

Hats and caps are best marked with a named tape stitched on to the lining.

Metal or enamelled badges are difficult to mark, but if they are sewn firmly to a well-marked article they are less likely to be lost. They can be commercially engraved for a small sum.

Watches, fountain pens, and propelling pencils can also be engraved, and this is a wise precaution, as many school children mislay these articles.

Leather and fibre school bags can be marked with writing ink inside the lid or can be initialled on the outside.

Bathing caps are difficult to mark, but named sticking plaster in the crown of the cap is fairly satisfactory. It needs to be renewed from time to time.

Rulers can be marked in ink, but geometrical instruments should have the name carefully scratched on. This is suitable for both metal and plastic instruments.

Games Equipment

Games equipment such as tennis rackets, presses, and covers and hockey sticks and pads should be clearly marked. The rackets and sticks can be marked with sticking plaster or indelible pencil on the end of the handle, but the covers and pads should be marked with marking ink. Presses should be clearly marked in writing ink which "takes" well on plain wood.

Small-change purses should also be marked with sticking plaster or ink on the inside.

Bicycles and pumps should be marked. This can be done by scratching the name on the handlebars and, as all bicycles carry a number, this should be noted. Pumps can also be marked by scratching on the name or by labelling it with named sticking plaster.

Heading photograph by Sparrow Industrial Pictures Ltd.

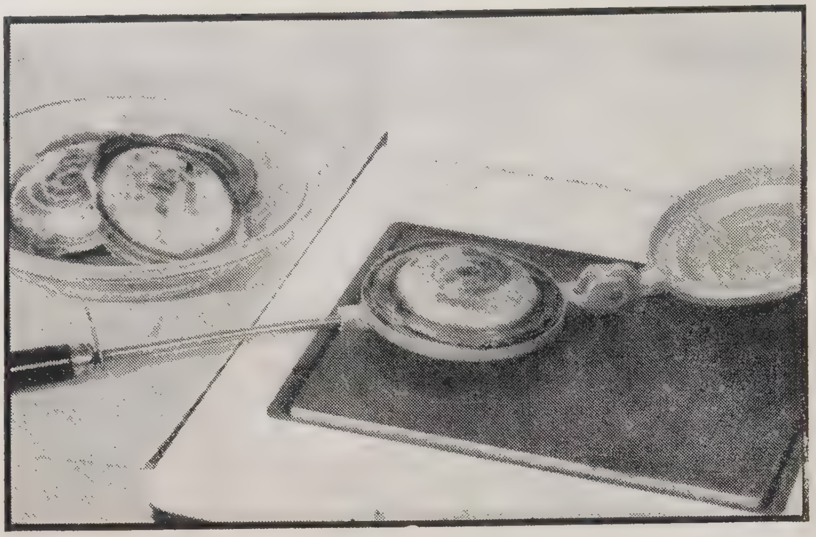
Savoury and Sweet Dishes from a Pressure Toaster

By EVELYN E. MOORE, Rural Sociologist, Department of Agriculture, Palmerston North.

AMONG the many new cooking utensils perhaps one of the most ingenious is the pressure toaster. It consists of two closely fitting metal plates attached to two long handles which can be clipped together when the food is placed in the plates. The toaster can be used over an open fire or on any type of stove.

SOME types have a flat base, so that they can be used economically on an electric stove; double toasters with flat bases which will just fit an electric hot plate and which are equally suitable for use on a coal stove or an open fire are also available. They are twice as quick and economical.

Pressure toasters are treated in the same way as gem irons or waffle irons. After washing they are seasoned by heating with about 1 tablespoon of dripping inside, and after being wiped with clean paper they are ready for use.



Cooking toasted pies in a pressure toaster.

Toasted Sandwiches

To make toasted sandwiches, the dish for which pressure toasters are perhaps most widely used, butter two slices of bread and place one, buttered side down, in the toaster. Pile the desired filling on the unbuttered side, place the other slice of bread, buttered side up, on top, and clamp the toaster together. Trim off the crusts, if this is necessary to get the toaster to close, and heat the toaster on both sides in the open fire or on top of the stove until the toast is golden brown and the filling is cooked. Until the operator becomes sufficiently experienced to judge the cooking time it will be necessary to check progress by opening the plates occasionally.

Fillings can be sweet or savoury, and the toasted sandwiches can be used as the main course in a luncheon or as the sweet for dinner.

Savoury Fillings

Place a thick slice of cheese in the centre of the unbuttered side of a slice of bread, season it with salt and pepper and pickles, tomato sauce, a slice of tomato, or grated onion, cover it with a second slice of bread, and bake the sandwich until it is golden brown on both sides.

Break an egg into the centre of the bread placed on the toaster, season it with salt and pepper, place the other slice of bread on top, clamp the toaster, trim the bread, and bake it slowly (3 or 4 minutes on each side when the iron is hot). Grated cheese may be sprinkled on the egg.

Other tasty savoury fillings are: Baked beans in tomato sauce and a strip of bacon; strips of bacon or bacon and tomato sauce or a slice of firm tomato; spaghetti and tomato sauce and seasoning; cooked mince and grated or finely sliced onion, tomato sauce, or cooked green peas; or seasoned left-over cooked fish with a sprinkling of grated cheese, lemon juice, white sauce, or a slice of tomato.

Sweet Fillings

Butter well two slices of brown bread and place one into the toaster butter side down. Pile thin slices of raw apple or grated apple on the bread and add a level tablespoon of a mixture of equal quantities of sugar and cinnamon. Place the other slice of bread on top, clamp the toaster, and bake the sandwich. Serve the dish with sugar and cream.

Alternatives to apple slices are sliced bananas, alone or with lemon juice or raspberry jam, sliced ripe pears and brown sugar or a sprinkling of finely chopped preserved ginger, or sliced or grated apples and raisins.

Dishes Without Bread

The pressure toaster may be used to cook sausages, boned chops, or grilling steak over an open fire, provided the plates have been greased previously, and the meats are as juicy and as tender as grilled ones. The use of the pressure toaster obviates the accidents which sometimes happen when meat is cooked directly over an open fire.

Other uses for the pressure toaster will doubtless occur to the housewife. For the enthusiastic picnicker, camper or tramper who does not mind carrying the extra weight they are especially valuable, as they can replace frying pans, which are not easy to handle over hot fires, and even very stale bread can be made into attractive dishes in these toasters.

ROUGH PUFF PASTRY

EASY to make and a pleasant change from short pastry, rough puff pastry may be used for pastry horns, pastry pinwheels, stars, patty cases, and crusts for either open tarts or deep pies. The finished product should be light, crisp, and golden brown.

Here is the recipe: Sieve 8oz. of flour and a pinch of salt and add 4 to 5oz. of lard or soft dripping cut into small pieces. Mix them lightly with a knife and add sufficient water to make a soft dough. Roll the dough on a floured board into an oblong ¼in. thick, fold it into three, and give it a half-turn to the left. Repeat this rolling and folding twice more. Bake it for 10 to 15 minutes at 475 degrees.

Ways of using rough puff pastry include:—

Pastry pinwheels: Roll out the dough into an oblong and spread it with any desired filling, for example, jam, marmalade, cinnamon and brown sugar, lemon cheese, brown sugar and nuts, savoury yeast extract and nuts, tomato relish, or smoked fish paste. Roll up the dough and cut it into ½in. slices. Place these on end in a greased baking dish.

Latticed flan: Line a shallow dish with pastry and fill it with jam or other sweet or savoury filling. Place strips of twisted pastry across the top in lattice fashion.

Bacon and egg pie: Divide the dough into two parts. Roll one part out to ¼in. thick and line a pie plate or an 8in. sandwich tin with it, trimming the edges. Cut two rashers of bacon in halves and place them on the pastry. Break 4 eggs on to the bacon. Cover the pie with the other part of the pastry rolled out to ¼in. thick. Pinch the edges together and trim them. Make two cuts in the top crust and decorate the pie with pastry leaves or flowers.

—*NELL MACPHERSON,*
Rural Sociologist, Department of Agriculture, Auckland.

Farm Life in Katikati's Early Days

KATIKATI is a settlement in the Bay of Plenty which has preserved much of the individuality of its early colonial life. It is prosperous now, but it was not always so, for it is a land where many dreams have come true.

"Athenree", the home of Mrs. Adela Stewart for nearly 30 years. The house is now more than 70 years old.

FROM the time of their arrival the people of Katikati prided themselves that they were special settlers; and they were. This isolated colony owed its existence to the inspiration of George Vesey Stewart, its founder and nominal leader. He conceived the idea of an Irish settlement with tenant farmers from Ulster to work the land, a few country gentlemen to provide capital and a congenial social atmosphere, and he himself to oversee as a sort of patriarchal head. He planned the settlement, making a grant of 40 acres to each member of the party and allowing 300 acres as a maximum for each family. He then made official application for and was granted 10,000 acres in the Katikati block, which the Government was to survey and road and he was to populate under the provisions of the Waste Lands Act of 1874. Last, he set about communicating his enthusiasm for the pioneering adventure to his countrymen. It is proof of George Vesey Stewart's ability as a writer and fluency as a speaker that the ships which had been provided by the New Zealand Government for his emigrants were soon fully booked.

The settlement when founded had a character of its own; it was a homogeneous group. Though there were social distinctions, the settlers were at least all of one family sharing the spirit of adventure and possessing the common ability to face difficulty and disappointment with generous comradeship.

Famous Old Homesteads

Many of the settlers built fine houses for which Katikati became famous, and though time has taken a very heavy toll, some of these still stand. It is fortunate that "Athenree", one of the most fascinating of these old homesteads, is also the best preserved. It commands a magnificent view of land and sea and combines individuality with beauty and comfort. In its hey-day it was said of the homestead that "there was graciousness in its grounds and the creeper-covered verandah and distinction in the drawing room with its grand piano". It seems to have possessed all the amenities of the civilisation which these settlers had known at home.

Mrs. Stewart, the lady of "Athenree", was a sister-in-law of George Vesey Stewart. A woman of culture, ability, and force of character, she became the acknowledged leader of the group at Katikati and was the mainspring of nearly every social activity, for such was her determination not to be buried in the drudgery of farm life that she threw herself into all the available activities with tireless enthusiasm. She conveyed some of that enthusiasm to her friends on her return to England when she published her diary. At one time almost every house in the Katikati district had a copy of the book, but now it is comparatively rare. There is a copy in the Alexander Turnbull Library. It is an elaborate account of the part a woman plays in the unremitting toil of turning a wilderness into a farm. The interest shown in this book when it first came out is worth reviving, for though it is a personal record, it tells the story of the lives of nearly all farm women. A résumé of Adela Stewart's book "My Simple Life in New Zealand" is given below by Helen Paine, Rural Sociologist, Department of Agriculture, Wellington, in the hope that the original aim of the author, that of interesting other women in the life of the pioneer, may be achieved.

A Perpetual Picnic

"A perpetual picnic" is Adela Stewart's description of life in the backblocks. On her return to England in 1906 after 28 years in New Zealand Mrs. Stewart published her diary, an unbroken record of the humdrum routine of farm life. She called it "My Simple Life in New Zealand" and thought it would provide an answer to the questions of her friends and relations, and hoped that it might help and interest other women.

The book is a day-by-day account of the activities of a family pioneering in the Bay of Plenty at Katikati. Little is given of their background, and the voyage out is hardly mentioned, but arrival in Auckland meant the beginning of a new life for Captain and Mrs. Stewart, so she recorded their many and varied experiences faithfully. They brought with them "our only child, Mervyn (seven years old) and Lou—a daughter of a dear friend . . . who proved an invaluable help to us. Soon after we settled she got married." In addition, there were two servants, a man and his wife.

Pleasure from Hard Work

For Mrs. Stewart colonial life was mostly work, and really hard work, but she got so much genuine pleasure from every achievement that it was never drudgery; her attitude toward the adventure of pioneering made it a perpetual picnic. ". . . 300 acres . . . which we had bought from our leader before leaving home and became possessed of by lot" was all that was owned, but Mrs. Stewart described the excitement of her first glimpse of that land. They pushed through the fern and manuka "until on an eminence we gazed on our future home, a limitless tract of undulating, uncultivated land".

The first necessity in any country is shelter. Before his family could move to their new home Captain Stewart had to build the nucleus of it; then at the first opportunity they all shifted in, and "got comfortably settled in a small sitting-room, large bed-room . . . and loft", all of which were intended for the stables when a proper house was able to be built, so there were many inconveniences. "Our wooden shingle roof, not being waterproof, necessitated keeping a supply of baths, basins, pie-dishes, etc., handy to catch the drops, which, with frequent moving of furniture, enabled us generally to have a dry bed. . . ." In their zeal they enjoyed "roughing it". They tackled all their problems with tremendous enthusiasm, delighting in improvisation. There was no kitchen, but in the outhouse with a clay floor Mrs. Stewart had her early cooking lessons.

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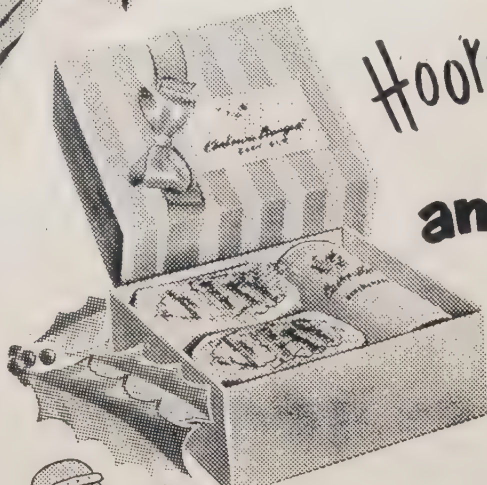
and holiday gift time



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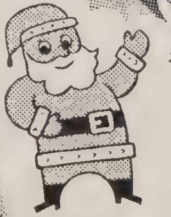

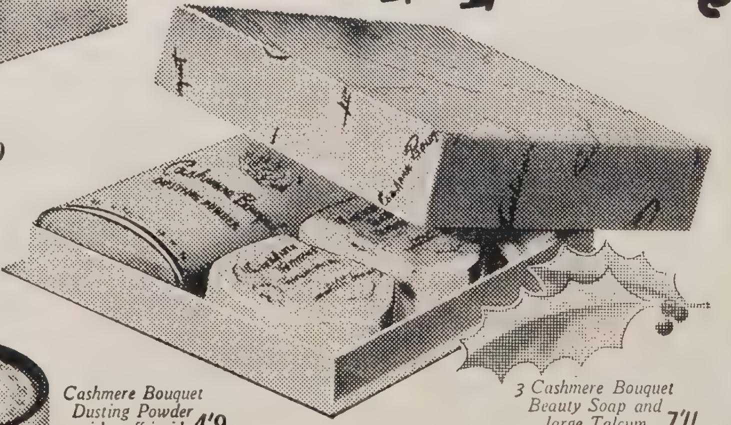

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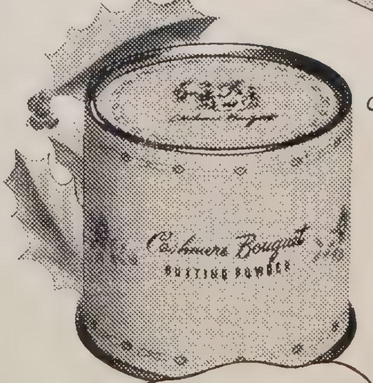

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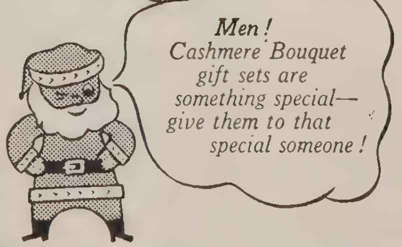

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COLGATE-PALMOLIVE PETONE

C4.9

"Then I made my first jam; spent hours peeling peaches . . . acting according to ignorant instructions, to boil this fruit with sugar for a day, at the end of which, worn out and tired with standing and stirring, in great heat, the result was a dark unattractive-looking and tasting compound. Experience . . . taught me simply to remove the stones, crack these, blanch the kernels by pouring boiling water over them, and boil them with the whole fruit and equal weight of sugar, as fast as possible for twenty to thirty minutes . . . when, having jars ready, you at once fill them with a bright-coloured clear preserve. . . . I was able after practice to make 500 to 1,500lbs. of jams, jellies, bottled fruits and marmalade every year, so that my store-room was a perfect picture!"

War with Nature

The Stewarts found themselves waging constant war with Nature. Their land was not first class, and the climate left much to be desired, but before long they had become enthusiastic gardeners, finding more pleasure in growing flowers and vegetables than in any other occupation. "Some of our garden experiences were very successful, others quite the reverse; but we learnt to bear our disappointments philosophically. . . ." And they learnt to make the most of the climate, feeling in the long rainy season that "all this wet weather was splendid for planting", and at the same time finding the mud and the dirt and the wet clothes trying. ". . . our patience was tried by rain, rain, rain, beating into our small quarters, and interfering hopelessly with the drying of our clothes. . . ." So they started whitewashing the ceilings of the rooms, then tacked scrim on to the walls, and covered them with paper. ". . . this was wet weather work and most satisfactory."

Of course it was never long before the summer came round again. "December came again with ever-increasing work, for it was shearing-time, and I had nine men all told to cook for. . . . Bread had to be baked every day except Sunday, so that we imported half a ton of flour at a time when the roads were good and rain not falling, using 100lbs. of flour a week. . . ." This is an indication of the amount of work that had to be done, often unassisted. "I alone prepared breakfast and the whole dinner for the first time . . . and was not I proud of it, and hot, too!" Then two young men who were fencing the farm taught her to make bread.

Mrs. Stewart was learning quickly, but "the early settlers' good, useful daughters were marrying fast", and as help was becoming difficult to get, she mostly worked alone. "It would be wearisome," she adds, "to enumerate my changes of servants and helps; the regret at parting with a good girl on her marriage, or relief at a useless one leaving because 'Mother has broken her leg', or 'is dying', or 'wants me to look after the baby', etc. Then I was often for weeks without help, but got no sympathy because all my friends were in the same plight."

One day's holiday meant extra work before and afterward in this busy life, but it was always considered worth the effort. "As a rule, we all walked on Sundays to Hillside for Morning or Evening Service, and I made hot-cross buns on Good Fridays, pan-cakes on Shrove Tuesdays, and, of course, plum-puddings and mince-pies on Christmas Days; thus, as far as possible, in our home in the Antipodes keeping up home customs and traditions."

Social Gaiety

They found time for a continual round of dances, picnics, tennis parties, and dinners, which were held in many of the scattered homes, often on an elaborate scale. "Next came a little gaiety in the form of a dance. . . . We walked . . . to Larkspur, our sister Mary's pretty place . . . and found all bubbling with excitement there in anticipation of the dance that evening, to which many came, although it was a very stormy night, beginning dancing at 8 p.m. and going on vigorously till 4 a.m., with intervals for supper at midnight and soup at 3. We spent a day or two there . . . and so home in ankle-deep mud roads in pitch darkness."

In summer other activities took the place of the dances, so there was never time to feel lonely even in this isolated spot. Mrs. Stewart's story from the beginning is one of hard work interspersed with social highlights. "Although next day was Sunday I had, contrary to my usual day of rest, to bake bread, set the night before—a very hot job on a very hot day. On Monday I was up at 5 a.m. to make butter, pick strawberries, and do a lot of extra cooking—roast goose, boiled ham, cakes, etc., for a picnic to-morrow. . . ."

It was not long before the house had to be enlarged. Expenses were increasing and views modifying, so it was decided to build rougher stables and make the present stables the nucleus of "Athenree", to be erected on a better site, necessitating removal of existing buildings intact on rollers. "Before doing so, the drawing room, 28 x 18, was built on wooden blocks rammed into the ground; then followed the studs, upper plates, ridge board, rafters, rusticated board walls, battens for roof, shingles, window sashes, one being a large bay commanding a fine view of practically unlimited Pacific Ocean, quite lifeless." Many rooms, a dining room 22ft. x 16ft., several new bedrooms, and a kitchen with a brick floor, were added—luxury compared with the old outhouse.

The homestead began to look more inviting as the trees and shrubs and garden grew up around it, and it was then that they christened the farm "Athenree", a name that was to become well known not only in Katikati and surrounding districts, but all over the North Island wherever travellers' tales were told.

Callers Many and Varied

Visitors of all sorts called there. ". . . now a piano tuner, of whose services we gladly availed ourselves for 25s., providing him with free board and lodging for the night, and the same for the bricklayer who came to build our chimneys. . . ." Tinkers, tailors, and watchmakers plied their crafts from house to house; tradespeople sold their goods in the same way; even the dentist called with his pedal-drill, and of course there were the many men tramping the country looking for work. All were welcomed, along with friends and relations, who often arrived without warning, knowing that food and a bed for the night were always available at "Athenree". The

Farmlands in the Katikati district.

injured, too, often came under Mrs. Stewart's care for the roads and tracks were primitive and many a cart and horse came to an end in the gorge behind the farm, but mostly the drivers escaped and reached the safety of the homestead.

In addition to all the usual domestic chores and the work in the garden Mrs. Stewart was kept busy with poultry, beehives, and an orchard, for a man breaking 300 acres into farmland has little time for the frills of vegetables and flowers. Nevertheless they brought in quite a lot of pin-money, and the list of produce for one year is almost unbelievable:—

8000 to 10,000 eggs, some being sold for 6d. to 14d. per dozen.

150 to 200 chickens and ducks, some being sold for 1s. 6d. to 2s. each.

100 dozen lemons sold for 50s.

An unstated quantity of onions and tomatoes sold for 1d. per pound.

Surplus Food Carefully Used

Flowers, too, had a market at 5s. a box when Waihi began to flourish as a gold-mining town. With all this produce available, food was never scarce; it was given away lavishly at parties and picnics, it was offered generously every day, but care was always taken to see that none was wasted. If there was no market for tomatoes, sauce was made; from a good crop of peaches some were preserved, jam used others, and if there was still a surplus, wine and vinegar were made in quantity; extra fish caught on a day's outing were smoked, walnuts were pickled, apples were made into cider; even the feathers plucked from poultry were saved until enough had accumulated to make a pillow. Quantities of honey for which there was no sale were used instead of sugar in the hop beer, making it much clearer and more sparkling.

Such tasks Mrs. Stewart describes in detail, for they filled her working day. Time was always precious, and her routine had to be simple and quick. Her washing-day method was that described in the "St. James' Gazette" by Miss Gordon-Cumming, traveller and authoress, who had visited New Zealand: "Put all the soiled clothes into the copper-boiler [Mrs. Stewart's held 25 gallons], fill it with cold water, add ½-lb. yellow soap cut in pieces. Next morning light the fire under the boiler, and as soon as the water boils, add two tablespoonsful of kerosene; boil as fast as possible for half an hour, take out the clothes, pass through an india-rubber wringer into clean, cold water, wring again into 'blue'd' water, and again into the big clothes-basket; hang on lines to dry. . . ."

Often when the washing was done, Mrs. Stewart would set to work to make all sorts of cakes, pies, and sausage rolls and piles of sandwiches. Then on one occasion after dinner "we started a party of thirty, in carts and on horseback, to the beautiful Waihi Beach spring, where the boys lit a fire, boiled water in billies, made tea and feasted. Then followed songs, dances and athletic sports on the sands, and so home at one in the morning by moonlight." One in the morning was early; often they arrived home so late that the next day's work had to be started before anybody had a chance to go to bed.

Time had to be found in among these varied activities to attend to Mervyn's education, which Mrs. Stewart thought was "quite necessary, as he was nine years old and most anxious to learn, also to play the piano. . . ." While teaching him she "filled the unforgiving minute" by mending and sewing, by making carpets and stuffing pillows, and in general doing all the jobs that she could not fit in at other times. Quite often she worked for a charity bazaar, when she would sew and knit in this her only period of relaxation, and then give a garden party to raise funds for a new hall or a church organ. Once she proudly recorded: ". . . my gross total being £41 9s. . . . and all were pleased with their money's worth".

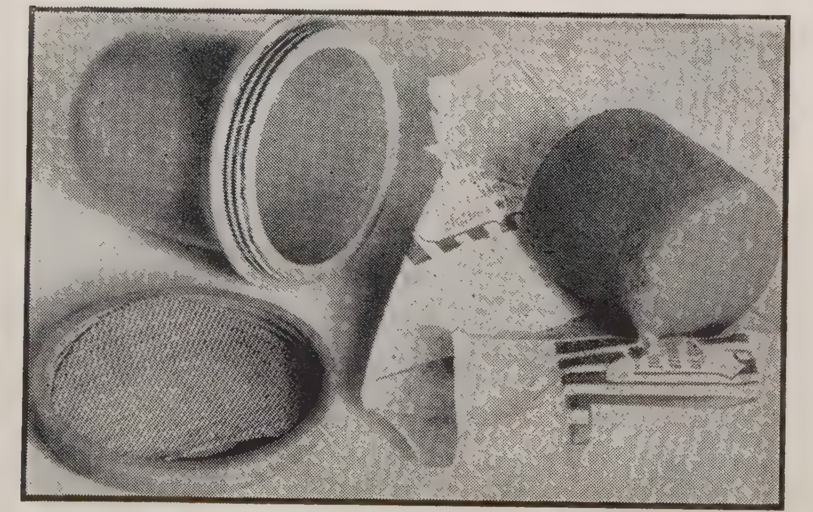
Decision to Sell

Twenty years had passed almost imperceptibly when illness, which had never before troubled the Stewart family, began to make their work more difficult. There was little chance of any assistance in the house or on the farm, because Waihi was nearby with its attraction of gold-mining and high wages. ". . . feeling our position getting desperate . . . we yielded, and sold the place at a great sacrifice." It was a decision made after much anxious thought, but until they left New Zealand their struggle was unrelenting; ever-increasing work and a determination to keep up with the customs of their youth made life very difficult.

Greater efforts had to be made each year as the dancing and the picnic seasons alternated; the occasional garden party or church bazaar called for more than Adela Stewart's failing health could stand, and the position became intolerable as agents and intending purchasers began to call. When the sale was made "the news spread like wildfire." Then came the farewells and parting addresses, all very exhausting for a woman already tired and ill, but she drove herself willingly when the end was in sight. "Visitors were so numerous that during this last week I did almost the record cooking, as all were entertained at dinner, tea, and sometimes bed to the very last."

Adela Stewart does not reflect at length on her parting with many friends and neighbours; she tells briefly of farewell socials and the last Sunday service, but her book finishes on a note of pathos as she parts with the beautiful old homestead built by her perseverance and energy. In her own words, "With closed eyes I passed the plantations of fine trees, which so many years ago, when young, strong, and hopeful I had made; they seemed like friends."

Plastic Holder for Washing Blue



[*Sparrow Industrial Pictures Ltd. photo.*

A HOLDER made of plastic to contain a knob of washing blue has a screw-on top with a wire-gauze inset. The filled holder is shaken through the tub of water until the desired depth of colour is attained. The holder is tidier and obviates the bother of tying the blue in cloth. Further, it does not make so much mess, as the water can be shaken out into the tub and there are no drips to discolour the windowsill or soap dish.

—*EVA TOPPING, Rural Sociologist,*
Department of Agriculture, Auckland.

The New Zealand Journal of Agriculture

Volume 81, July-December, 1950

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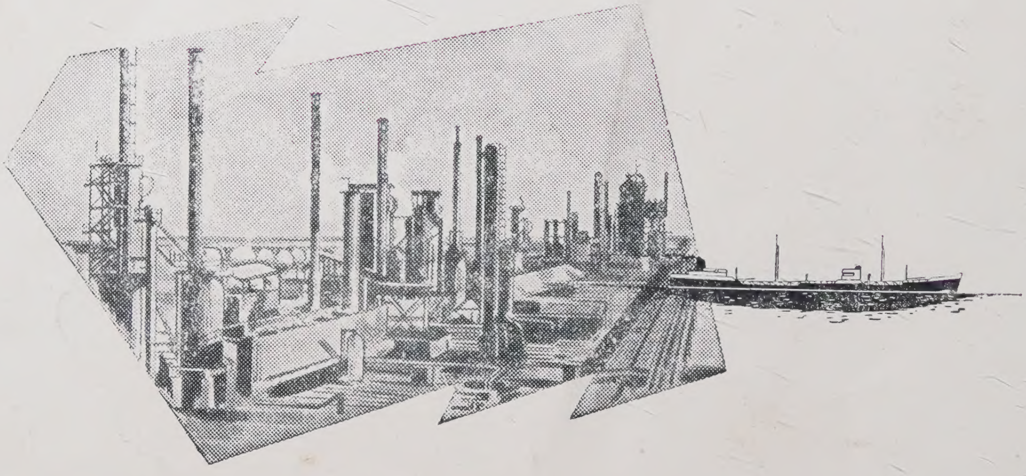

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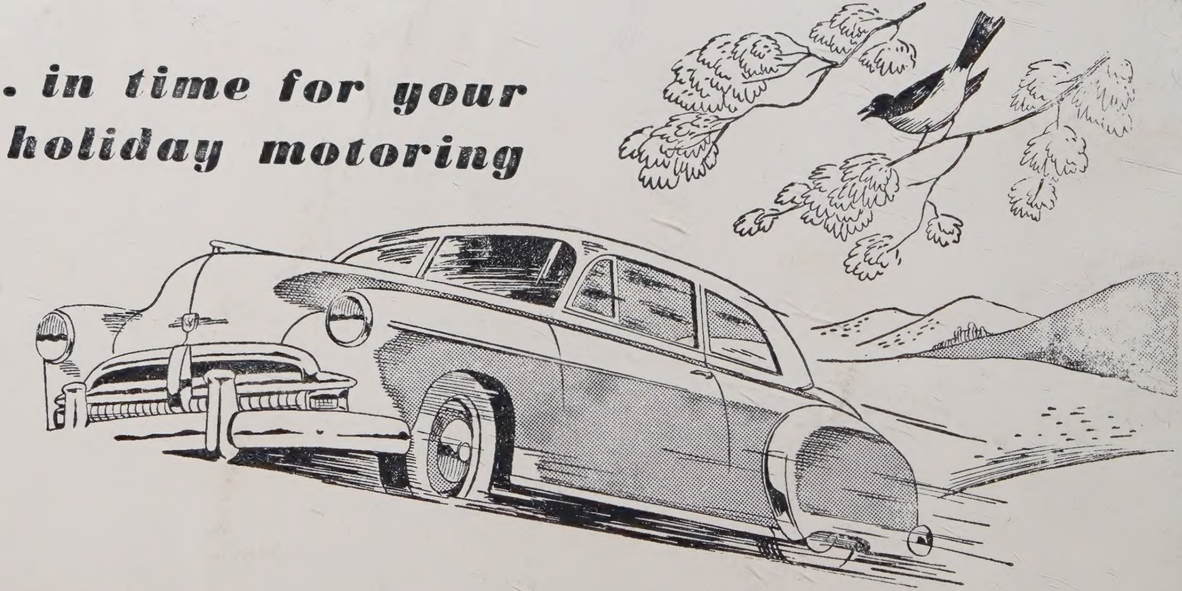

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